






★4091  
211

Accessions	Shelf No.
435.432	★6849.5
Vol. 6 1888.	



FOUNDED 1852  
SIT T. PATRIBUS SIT DEUS NOBIS  
BOSTONIA  
CONDITA A.D.  
1630.  
BOSTON PUBLIC LIBRARY

Received July 20, 1889.









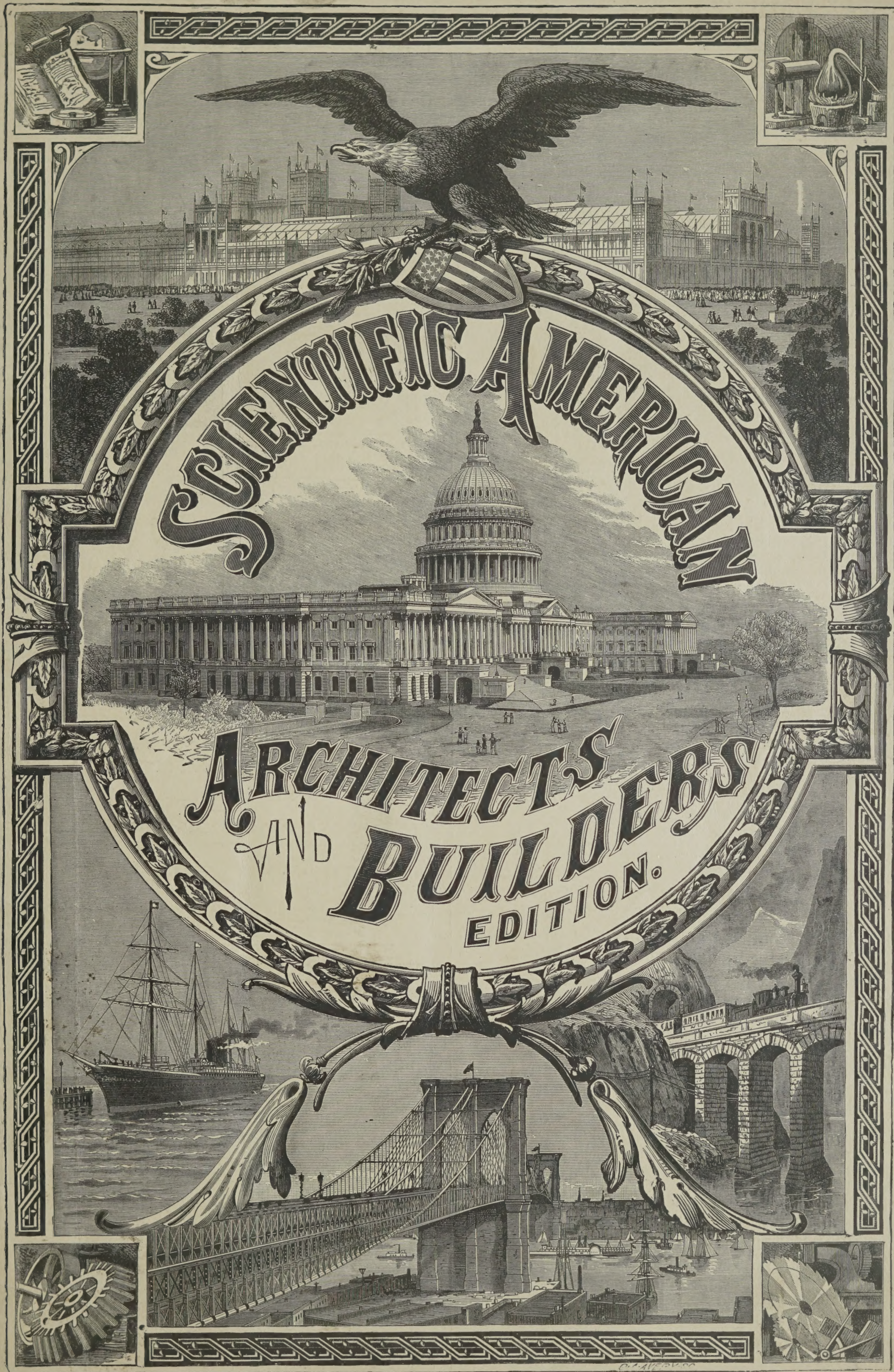












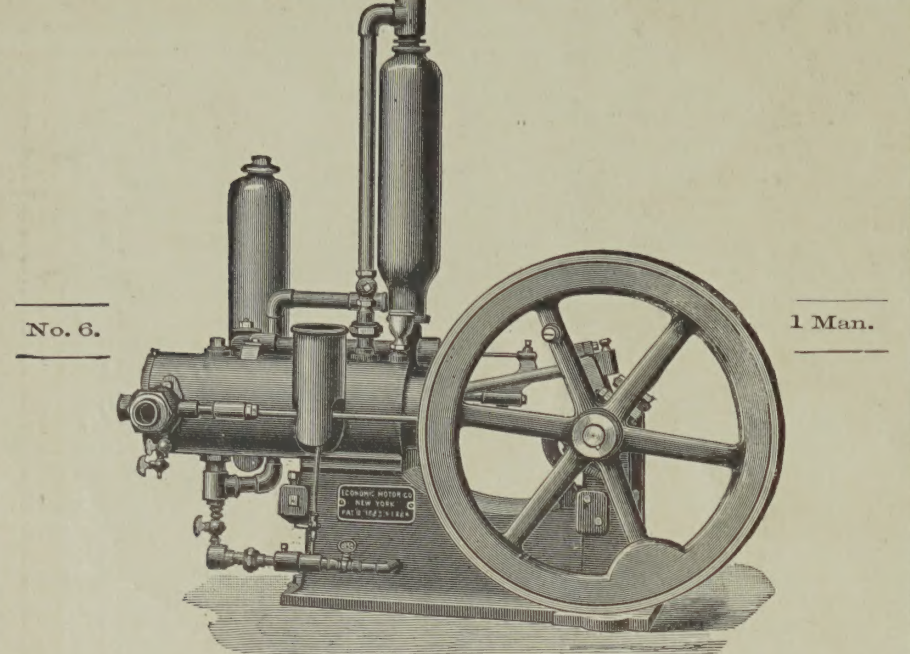


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra Insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

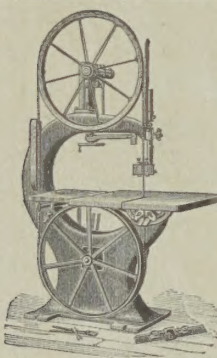
- No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.
- No. 8. One Horse, - 1,500 " " " "

## GASOLINE GAS ENGINES.

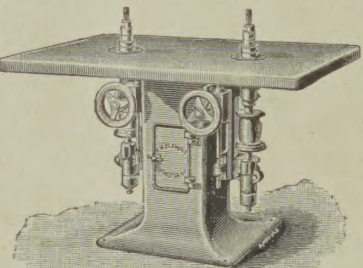
- No. 15. One Man, - 300 Gallons, 50 feet High, per Hour.
- No. 16. One-Half Horse, 600 " " " "
- No. 18. One Horse, - 1,500 " " " "

Four Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power. Our Gas Engines will work satisfactorily when attached to Gasoline Machines.

SEND FOR ILLUSTRATED CATALOGUE.  
Economic Gas Engine Co.,  
Office and Salesroom, 34 DEY ST., NEW YORK.

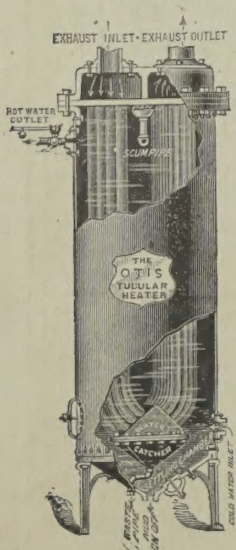


**CARPENTERS' AND BUILDERS' WOODWORKING MACHINES.**  
Planers, Saws,  
Lathes, Shapers,  
Combination  
Machines,  
Shafting, Pulleys, etc.  
**ENTIRE OUTFITS.**  
F. H. CLEMENT,  
119 MILL ST.,  
ROCHESTER, N. Y.



**IN OFFICE BUILDINGS,**  
with *U. S. Mail Chutes*, (pat'd),  
and the *U.S. free collection service*,  
tenants mail letters without  
going down stairs. Write for par-  
ticulars. *The Cutler Mfg. Co.,*  
*Rochester, N. Y.,* Sole Makers.

## THE OTIS TUBULAR FEED WATER HEATER

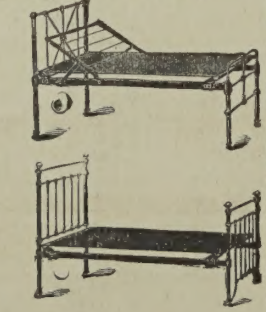
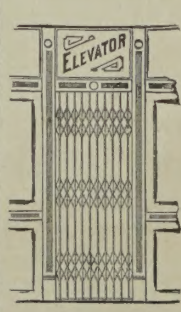


With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of  
**ELEVATOR PUMPS,**  
both Passenger and Freight to heat the Feed Water for the boilers.  
We guarantee one square foot of heating surface per horse power.  
We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.  
MANUFACTURED BY  
**Stewart Heater COMPANY,**  
40 & 42 Clinton Street,  
BUFFALO, N. Y.

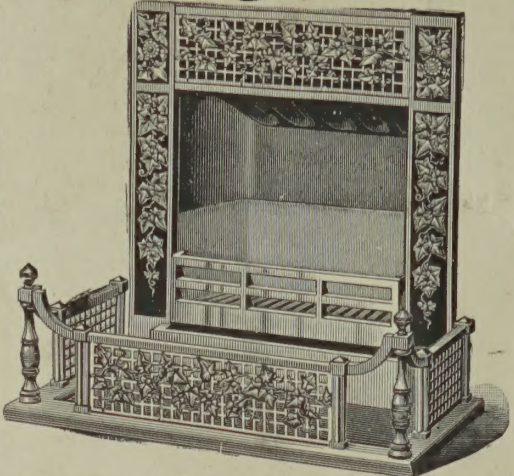
**COMPOSITE IRON WORKS CO.**  
83 Reade Street, New York.  
Established 1847.



**Artistic Iron Work**  
—FOR—  
**BUILDINGS.**  
Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



# THE JACKSON Ventilating Grate & Fireplace Furnace



## A FURNACE IN THE FIREPLACE.

So combined with the grate as to increase the heat of the latter fourfold, and effect perfect ventilation by producing an inflow of warmed outdoor air and exhaustion of the air near the floor.

**OVER TWO HUNDRED**  
**different styles of design and finish**

In use ten years, with all kinds of fuel; heating rooms adjoining, or on different floors. Reports from every State and Territory, and

**ILLUSTRATED CATALOGUES**  
Sent on Application.

**EDWIN A. JACKSON & BRO., 50 Beekman St., New York.**

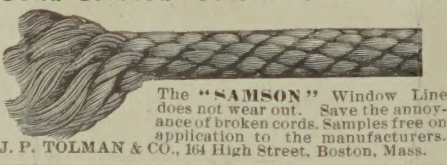
**ARCHITECTS, BUILDERS!**  
**ATTENTION IS CALLED TO**  
**ADVERTISEMENT ON PAGE iii**  
**FRANK B. MALLORY.**

**SPECIFICATIONS SHOULD INCLUDE**  
**Folsom's Patent Roof Snow-Guards**



Address, —300,000 IN USE.—  
**JOHN H. HILLER, 140S Tremont St., Boston.**

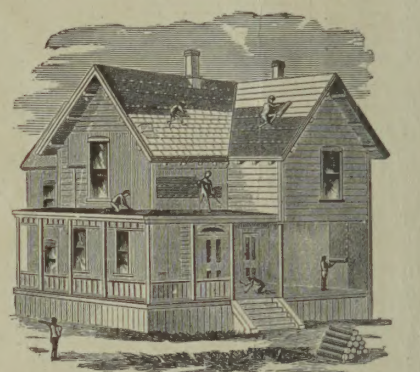
**Solid Braided Cotton Sash Cord.**



The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers.  
**J. P. TOLMAN & CO., 164 High Street, Boston, Mass.**

## ASBESTOS FLOORING FELT.

Patented August 20, 1872.



For Lining between Floors, under Slates, Shingles, Clapboards, &c.

Offices: 169 Congress St., Boston.  
33 John St., New York.

# SCHUMACHER & ETTLINGER, LITHOGRAPHERS,

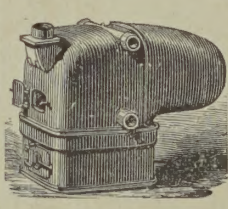
32, 34 and 36 Bleecker and 311 Mott Streets,  
**NEW YORK.**  
FINE COLOR WORK A SPECIALTY.

# Dwelling-Warming Hot-Water System.

**HITCHINGS & CO.,**  
233 MERCER STREET, N. Y.

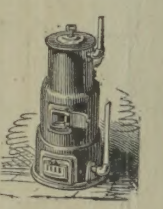
—ALSO—

## Greenhouse Heating and Ventilating Apparatus.



Estimates of cost furnished on application.

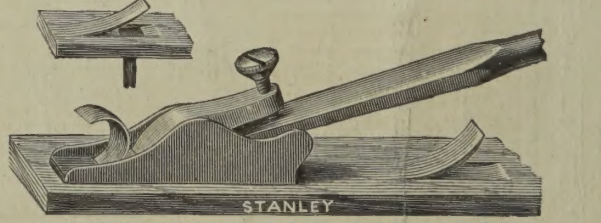
**SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.**



**IMPROVED**  
**Labor-Saving**  
**CARPENTERS'**  
**TOOLS.**  
**STANLEY**  
**RULE & LEVEL CO.**  
**New Britain, Conn.**

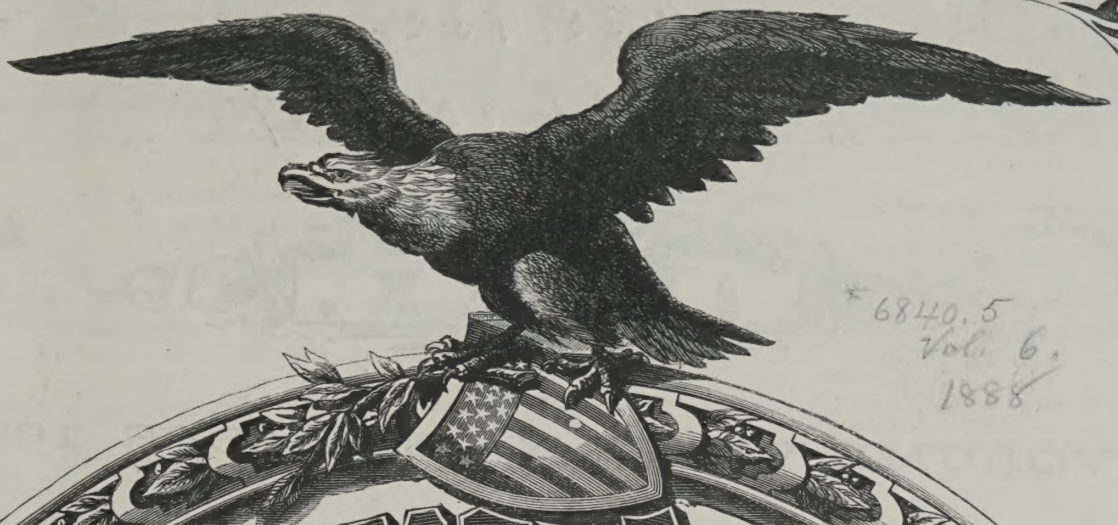
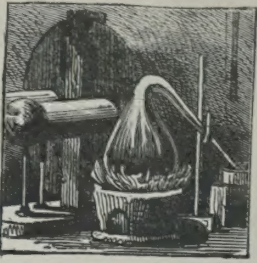
The "Woodworker's Guide" mailed free, on application.

## Stanley's Adjustable Chisel Gauge.



A principal use of this simple device will be found in finishing work, where Blind-Nailing is required. It can also be used for inlaying wood strips in ornamental surface work.  
By attaching the Gauge to a 1/4 inch Chisel (with beveled edge up) a shaving of any thickness can be raised with precision; and when glued down again, this shaving will fit its recess perfectly.  
No. 96. Chisel Gauge, Steel Stock..... \$0 20

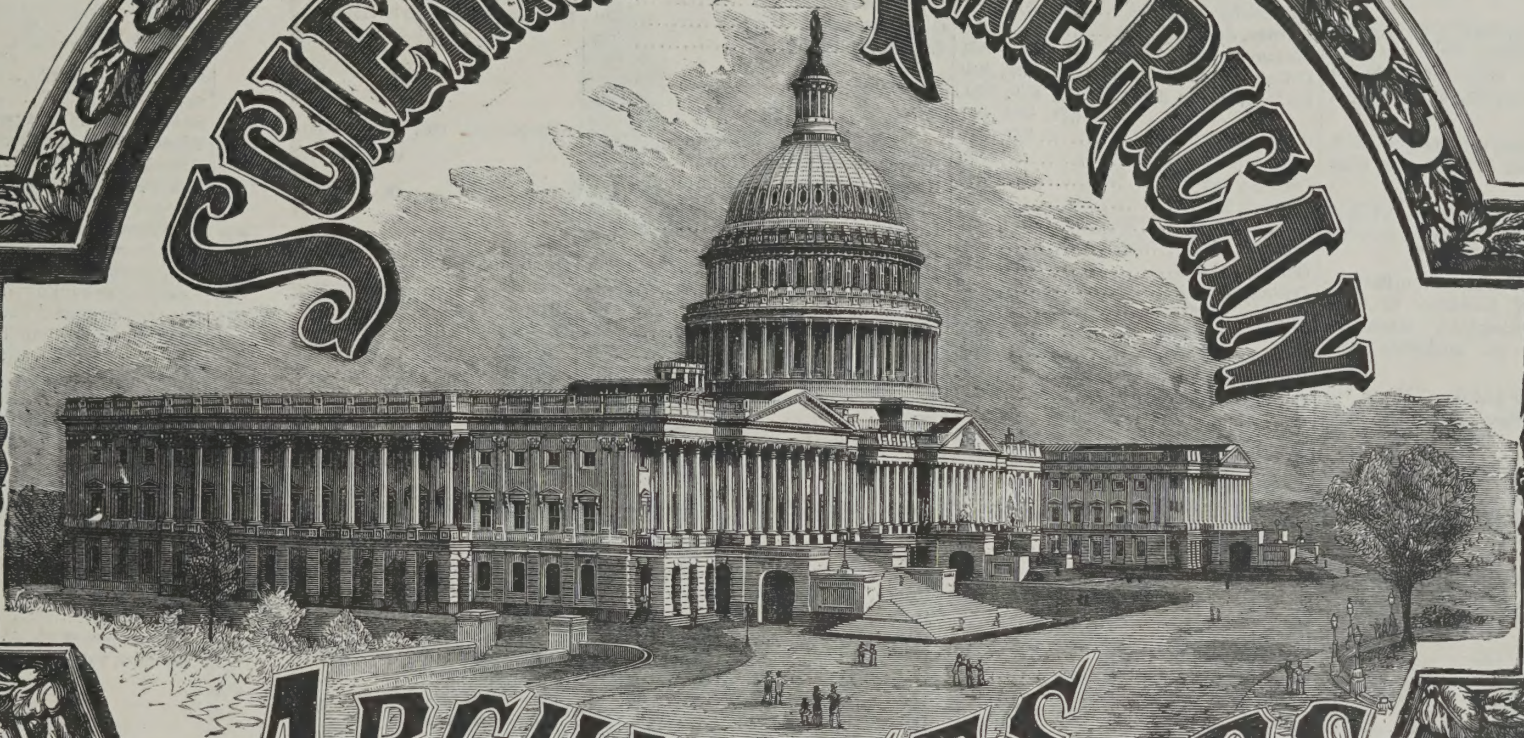




6840.5  
Vol. 6.  
1888

LIBRARY  
OF THE  
CITY OF BOSTON

# SCIENTIFIC AMERICAN

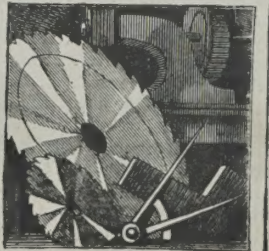
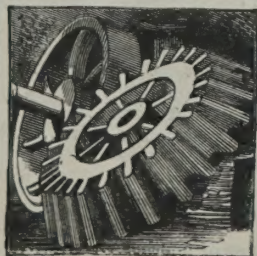


## ARCHITECTS AND BUILDERS EDITION.

Vol. VI.

JULY-DECEMBER,  
1888.

MUNN & CO., PUBLISHERS,  
No. 361 Broadway, New York.



GAVERY-50



# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

NEW YORK, JULY, 1888.

THE

## Scientific American, ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

**An Increase of Trade** will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

**Bound Volumes.**—Two volumes are published annually. Volumes 1, 2, 3, and 4, which include all the numbers of this work from commencement to close of 1887, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,  
361 BROADWAY, NEW YORK.

For additional information concerning any of the plans or buildings illustrated in these pages, address MUNN & Co., as above.

### CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN &amp; Co., Publishers, 361 Broadway, New York.

### CONTENTS

Of the July number of the ARCHITECTS AND BUILDERS EDITION OF SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

Boiler, steam and hot water heating, Bronson*.....	21	Heater, steam, Victor, Richmond*.....	20
Bricks of blown glass.....	7	Houses, \$1,200, at Kingsbridge*.....	13
Bricks, slate.....	75	House, modern, \$2,000*.....	17
Buildings, cheap, in China.....	20	Houses in Seville.....	16
Carriage house and barn, design for.....	8	Houses, town, undesirable.....	19
Chapel of the Pocito, Mexico*.....	10	Museum, design for a*.....	4
Chimney shaft.....	6	Organ, largest.....	21
Church at Nashville, Tenn.*.....	10	Others, many, like it.....	7
Cottage, \$400*.....	16	Paintwork.....	3
Cottage, \$1,050*.....	12	Pantograph, an improved*.....	2
Cottage for \$1,550*.....	12	Plans, floor, for cottage of moderate size*.....	3
Cottage, \$2,000*.....	8	Plans, floor, for suburban dwelling*.....	3
Cottage at Jekyll Island, Ga.*.....	2	Post office, Houston, Tex.*.....	14
Cottage, oldest, at Asbury Park*.....	16	Pump, hand force*.....	22
Cottage, pleasant*.....	19	Recess, how to fit up.....	22
Cottage, "Queen Anne," \$1,400*.....	7	Residences in Connecticut*.....	11
Court house and post office, Chattanooga, Tenn.*.....	15	Sawdust.....	21
Court house and post office, Oshkosh, Wis.*.....	19	Sheep, merino, Vermont.....	21
Court house and post office, Troy, N. Y.*.....	14	Shells as a decorative element.....	16
Court house and post office, Williamsport, Pa.*.....	15	Stars, age of.....	6
Cottage, suburban, Fordham Heights*.....	6	Trammels, extension beam, Cook's*.....	22
Details for colored plates*.....	2	Tunnel, Durango.....	9
Details for cottage of moderate size*.....	4	Villas and their doorways.....	12
Dumb waiter, improved*.....	5	Water for household use.....	18
Dwelling, a suburban.....	2	Wood that will not blaze.....	6
Fans, ventilators, etc.*.....	21		
Floors, hardwood, treatment.....	17		
Furnaces, ranges, etc., Boynton*.....	22		

### A COTTAGE OF MODERATE COST.

One of our colored plates for the present month of July shows a neat and attractive cottage, the floor plans for which we give on page 3, and the details on the page following. The dimensions are:

Front 31' 6", side 45' 9", not including back pantry. The floor plans show the area of the rooms. The heights of stories are: cellar 7', first story 9' 6", second story 9', attic 8'. Foundation 12" brick wall. First story clapboarded, second story shingled, roof shingled. Cellar under whole house.

Two bedrooms in the attic and large open garret, open fireplaces in parlor, dining room, reception room, and two bedrooms. The back stairs landing on platform of main stairs saving considerable in expense. The rooms and halls all conveniently arranged, ample closet room throughout. Cost complete with furnace, \$5,800.

### A SUBURBAN DWELLING.

This forms the subject of one of our colored plates for the present month. The floor plans are given on page 3, and the details on page 5.

The general dimensions are: Front 40', side 49', not including piazza. The floor plans give the dimensions of the rooms. Height of cellar 7', first story 9' 6", second story 9', attic 8'.

Foundation stone with brick underpinning, first and second stories clapboarded, gables shingled, roof slate. Cost complete with furnace, \$6,000.

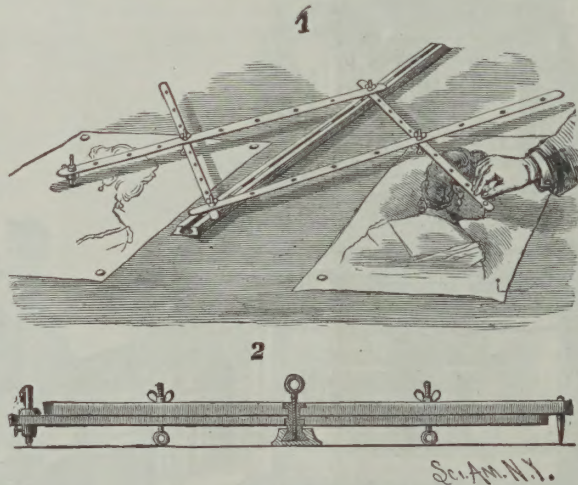
**Special Features.**—Cellar under whole house, open fireplaces in parlor, dining room, sitting room, and one chamber, two rooms finished in the attic, and large open garret; rooms and halls conveniently arranged; ample closet room throughout.

### DETAILS FOR OUR COLORED PLATES.

Instead of the loose sheet of details ordinarily issued with each of our numbers, we this month present the details for the colored plates in the body of our paper. By reducing the scale on which the details are given, we are enabled to give them in more compact form; but as the scale is given for each part of the details, any builder will be able quickly to enlarge the same to full size if desired.

### AN IMPROVED PANTOGRAPH.

The invention herewith illustrated may be easily constructed, and provides a pantograph which will



RICHE'S PANTOGRAPH.

copy, enlarge, and reduce drawings. The arrangement of the pivoted bars and the series of holes therein will be readily understood from the illustration, as well as the purpose of the central longitudinal bar and its slides, a cross-sectional view in Fig. 2 showing the groove in the central bar in which the slides move.

To copy an engraving, the arms are balanced as shown in the picture, their motion being limited by the stationary pivot shown at the lower end of the central longitudinal bar. A tracing point in one arm of the pantograph is then carried by the hand over the details of the picture, which are reproduced by the pencil carried by another arm. Enlargements and reductions are effected by placing further in or out, in the holes shown, the bolts pivotally connecting the cross arms, thus increasing the leverage of either the pencil or the tracing point. In employing the pantograph for reversing, pivotal screws are inserted in both slides, and the slides themselves left free to move in the central longitudinal slot. Lines then drawn parallel with the central bar, and by the sliding of the pantograph therein, will be made by the movement of the entire pantograph, and will be parallel, but when drawn at right angles to the bar they will be formed in opposite directions on its opposite sides, reversing the picture. Thus a face looking toward the right in the original can be made looking toward the left in the copy, and all of the lines drawn by the instrument when so adjusted will be reversed.

This improvement was designed by Lieut. Charles S. Riché, U. S. A.

### DESIGN FOR A MUSEUM.

This drawing is one of a competitive set of plans and elevations for a museum, made by Pelz & Griebel, architects, in 1885.

The main feature, required in the prospectus, is the grand memorial tower and main entrance to building. The expense of this portion of the building was not limited.

The front of this tower is planned at an angle of 45° to the front walls, forming a large triangular space, raised to a platform, 4 feet above pavement, and approached by wide granite steps. At each corner of the triangular platform a polished granite pedestal is surmounted by a gigantic bronze group, one at each pier and one at the corner of building line.

The grand entrance arch is carried by columns of dark polished granite, and the crown of this arch reaches to a height of 64 feet above the level of the curb. Broad steps at the base of the columns ascend into the octagonal shaped memorial hall, 75 feet high, and crowned by immense groined arches, in the center of which, fronting the entrance, stands a colossal bronze statue, raised on a half-round platform, around which granite steps lead to the level of the first floor.

This hall receives a flood of light through the main entrance arch and two similar arches at the sides, leading into side halls, and receiving the light through the arches in the front walls. All of marble, with granite bases, tile-laid floors, brass railings, the panels in piers in marble of different colors and textures, and all columns supporting the arches of dark polished granite.

Large doors in rear wall of main hall open into a grand vestibule, highly decorated, and at the rear of this, facing the entrance, rises the first flight of main stairs up to a platform, lighted brilliantly through stained glass windows, from the court. At each side the steps descend to basement, where, through and under the memorial hall, the carriage drive passes from one street to the other, parallel to the front of the tower. These main stairs ascend to the third floor, above which open galleries permit the light to descend from the roof.

The first story, surrounded by galleries, and the second story contain large exhibition rooms, lighted brilliantly from the front windows and from the two courts, these latter being divided by a center wing. In the basement the two courts are covered with glass, and connected under the center wing by open arches. The basement interior was intended for a glyptotheca, and the inner rooms connecting with the courts to be decorated in the different architectural styles, the statues placed therein to be of the same style and character.

The outside rooms of basement, fronting on street, are intended for sculptors and other offices, stores, etc.

The third story is to contain art schools, lecture rooms, halls, committee rooms, etc., and all the remaining stories are laid out in studios and offices of different kinds and sizes.

Connected with the above is a large restaurant, with dining rooms, etc., accessible from every point of the building, and at the opposite end of the building a large ball room, with stage, assembly rooms, etc., all easily accessible from street, and convenient to dining rooms.

All engines, boilers, heating apparatus, dynamos, store rooms of every description, are placed in the cellar. The kitchen, caterer's apartments, employes' rooms, elevator, and house tanks, etc., are placed in the attic.

The materials used for the front are mainly marble. The basement and up to sill course of first story is of granite. First and second story is entirely of marble, ashlar and trimmings, and the upper stories of marble trimmings with face brick paneling. The Mansard roofs are of slate, and all tower and turret roofs of copper. All statues embellishing the facades are white marble.

The height of tower from curb line to finial is 350 feet.

The perspective view was drawn mainly by Mr. Pelz, of Washington, now of the firm of Smithmeyer & Pelz, engaged in putting up the Congressional Library, they also being the architects of the Carnegie Library, of Pittsburgh. Mr. Griebel now has his office in New York, and has done considerable work for the Clark estate and others. He has formerly been architect for the government for a period of over eight years.

### Park Areas.

The Central Park, New York, has an area of 864 acres; Fairmount Park, Philadelphia, 2,648 acres; South Park, Chicago, 1,055 acres; Forest Park, St. Louis, 1,372 acres; Druid Hill Park, Baltimore, 700 acres. The great park of San Francisco has an area of 1,040 acres. The parks of Paris are in its environs, and include the Forest of St. Germain, 8,000 acres; the Bois de Boulogne, 2,208 acres; the Bois de Vincennes, 2,500 acres; and the parks of St. Cloud, 1,000 acres. The Forest of Fontainebleau covers 42,000 acres. Tokio, Japan, is celebrated not only for the number but also for the extent and beauty of its parks. Richmond Park has an area of 2,253 acres; Windsor Park, 3,800 acres. Phoenix Park, Dublin, comprises 1,753 acres.

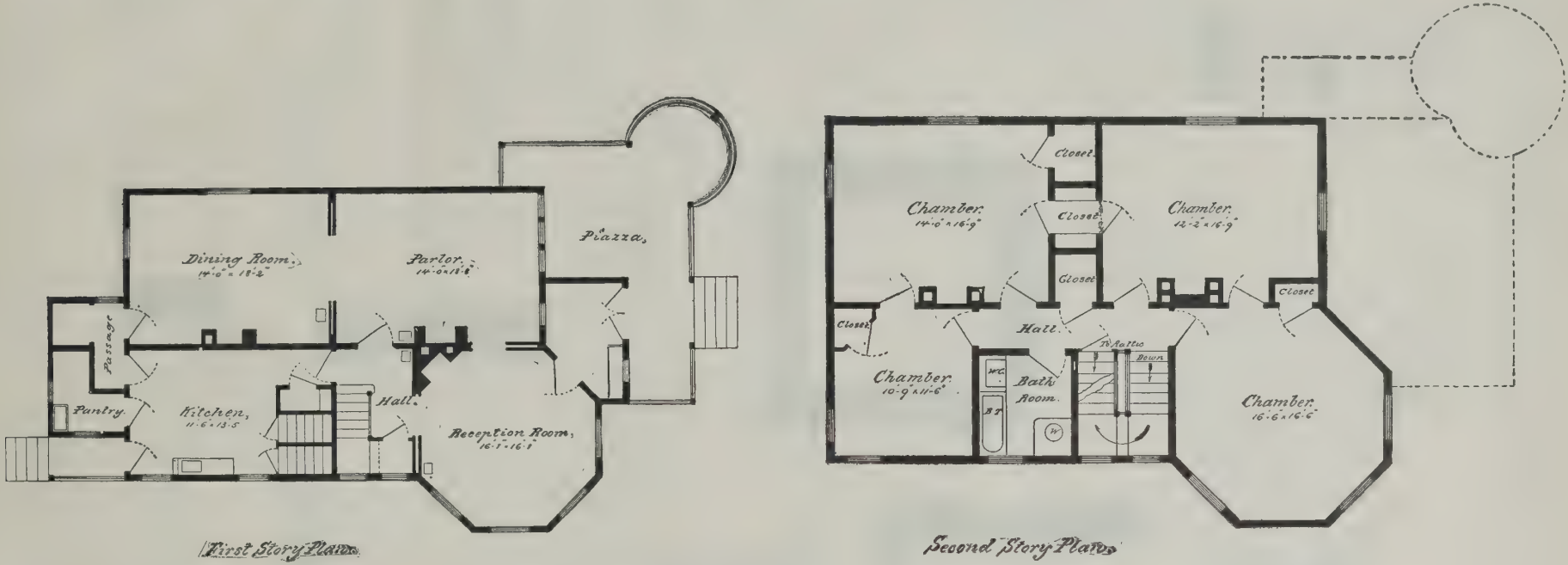


Paintwork.

It may be useful to know that a gallon of paint will cover from 450 to 630 super. feet of wood. On a well painted surface or iron the gallon will cover 720 feet. In estimating painting to old work, the first thing to do is to find out the nature of the surface, whether it is porous, rough or smooth, hard or soft. The surface of stucco, for example, will take a great deal more paint than one of wood, much depending on the circumstance whether it has been painted, and what state the surface is in. We have known prices tendered for outside painting that have been seriously wrong, owing to the want of knowing the condition of the stucco work. A correct estimate of repainting woodwork cannot be made from the quantities only. A personal examination ought to be made in every case where there is much work to be done. A great many painters trust

taking three men for one day. According to Saxton, 45 yards of first coat, including stopping, will require 5 lb. of white lead, 5 lb. of putty, 1 quart of oil. The same quantity of each succeeding coat will require the same allowance of white lead and oil. The best materials will last for seven years, but the ordinary painting seldom lasts three. It is questionable in building whether a saving is not possible by reducing the painted work as much as possible, and in using hard and ornamental woods for all ordinary interior framing exposed to wear like doors, cupboard fronts, dadoes, stair balusters, spandrels, etc. In a few years the cost of repainting would more than repay the extra expense of materials. Take, for instance, an ordinary dwelling house let for £35 to £40 a year. In seven years the whole interior paintwork requires redoing—an expense that generally falls upon the landlord, who is tempted to have the work

Every tenth board goes for sawdust, and we even think the sawer will correct us right here and say that the kerf of the circular saw will represent one-fourth of an inch in every cut, or a full sized board for every eight cuts of the saw. But leaving it at ten per cent., the figures on a season's cut show a terrible contribution to the waste of lumber. This is no new subject for mental cogitation, but is one which has ever proved a "pons asinorum" to the lumber economist. Many and varied are the ways by which it has been sought to utilize sawdust. Alcohol is said to be found in it in paying quantities. Fuel is stated to be obtained from it by mixing it with crude petroleum, and under hydraulic pressure squeezing it into compact blocks. Where mills are driven by steam, it can be used for fuel. It makes good bedding for horses, and would be valuable in that way, could it be shipped



FLOOR PLANS FOR COTTAGE OF MODERATE COST.

[See colored plate ; also details, page 4.]

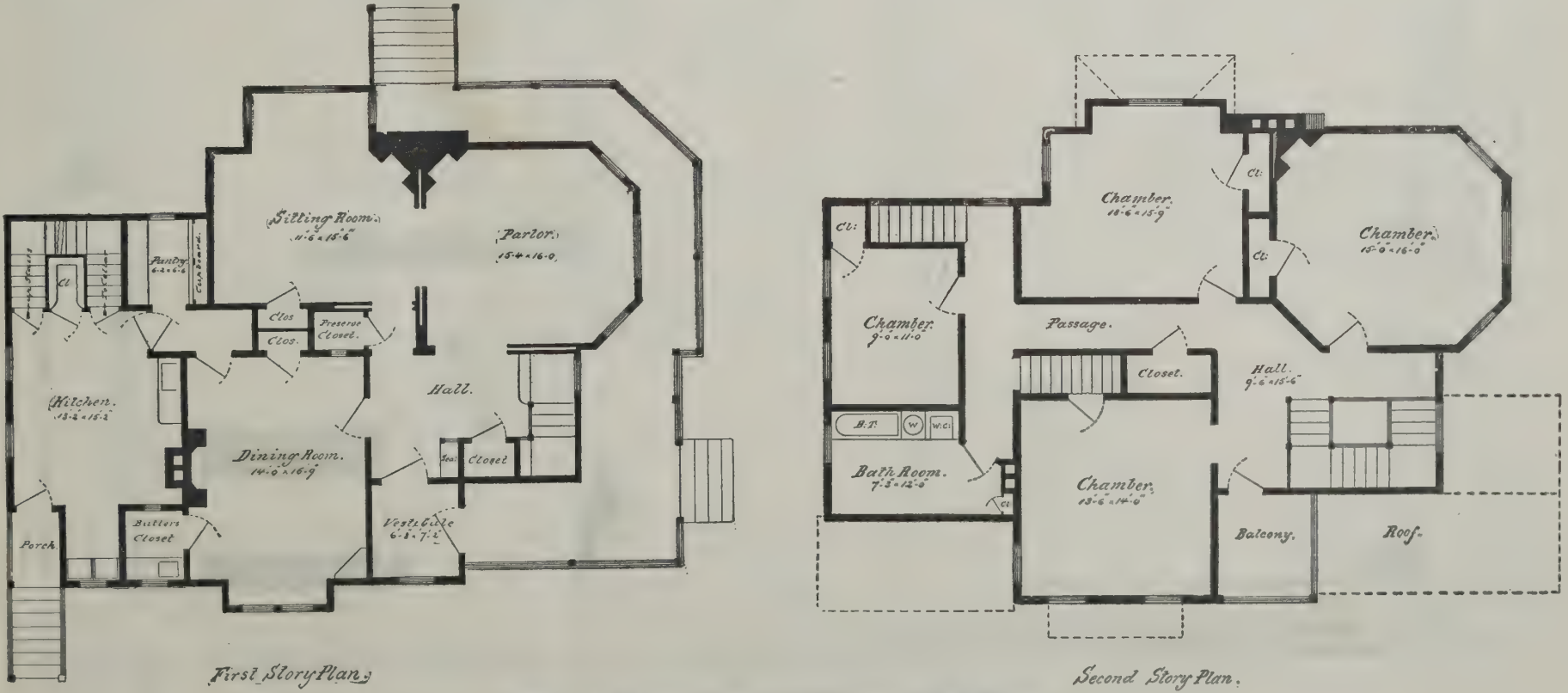
to the quantity. The consequence is nothing is allowed to remove old paint, or scouring, and the stopping of cracks. Then there is painting and painting. It can be done well and artistically, or indifferently, and few trades allow of greater scamping. In first class work, after the first two coats have been put on, the paint, when dry, should be rubbed down with pumice stone before the finishing coats are put on. Inferior painting is so common that it has a demoralizing effect on painters of the day. The quality of the material, especially the white lead, has much to do with permanency. We find painting done on old work without any cleaning, stopping, or even pumicing. A slovenly and inartistic class of grainers are also met with, who repaint and regrain on work that ought to be well rubbed with pumice stone or sandpaper before the first new coat is laid. For painting three coats, the following materials are given for 100 superficial feet of new work: Paint 8 lb., boiled linseed oil 3 pints, spirits of turpentine 1 pint : the work

done cheaply, with the usual consequence that every new tenant wants the painting done.—*Building News*.

Sawdust.

A representative of the *Timberman* recently looked wonderingly upon a pile of sawdust, which may be calculated to represent 30,000,000 of pine lumber. It may be a wild guess as to quantity, but that pile represents the sawing of ten years of a water mill cutting 45,000 per diem. It is about three-quarters of a mile long, sixteen feet high, and some hundred feet wide. These figures are here given in order to gratify the insatiable thirst or hunger of some "smart Alecks" for something to find an error with in the footing. To the ruminating scribe, the pile represents 30,000,000 of pine wasted. This is only one mill and one pile of sawdust. If the calculation be carried to all the mills in the country, the sum total will be a startling one. It is not very extravagant to say that the tithing law of the Bible, viz., a tenth part, is in full force in our sawmills.

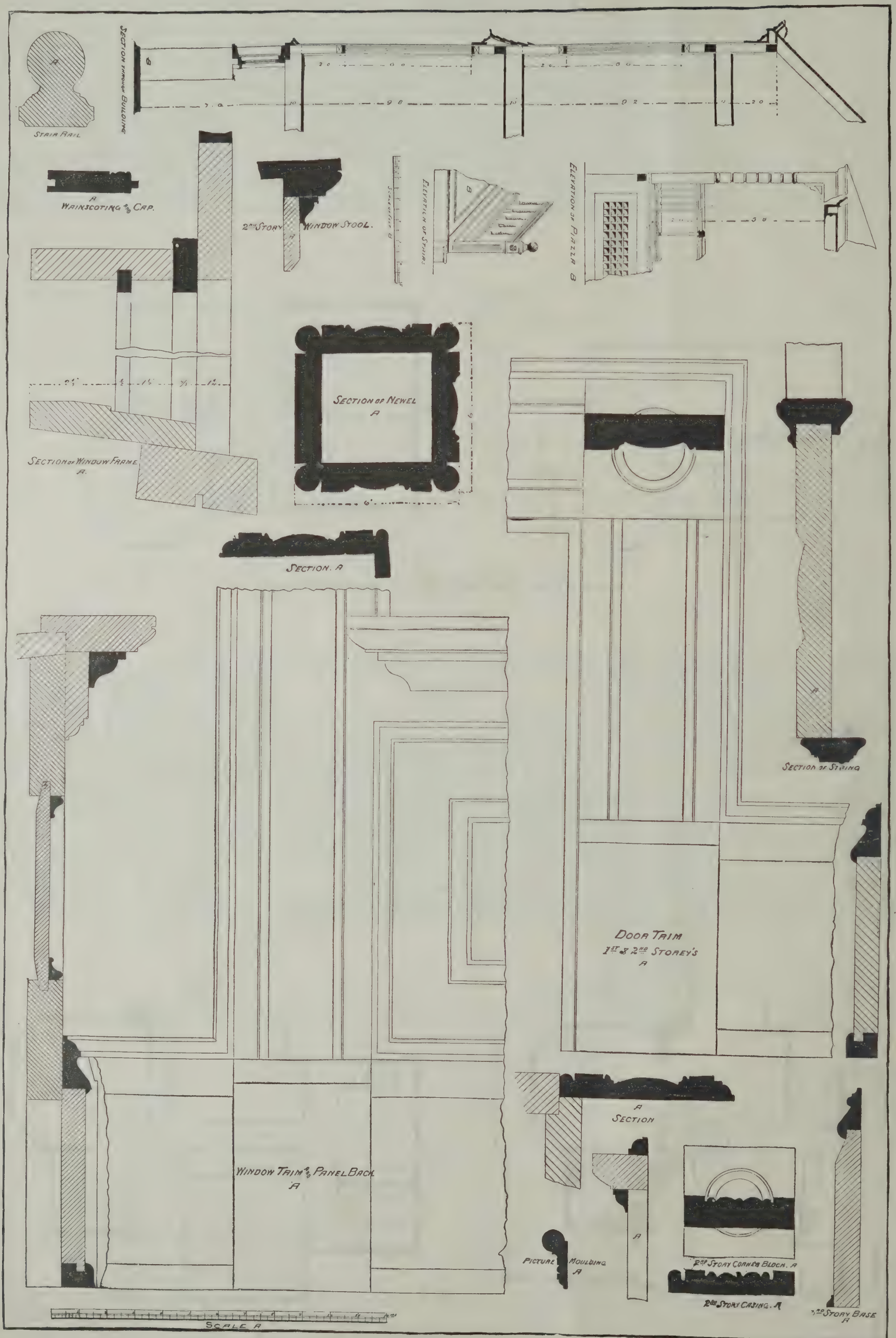
without costing too much. A party of the bucolic persuasion told the writer a short time ago that he calculated to get out a shipping patent on sawdust, according to the following plans and specifications: Mix it with water in moulds and freeze it into solid masses in size fit for handling, and ship it like ice, to be thawed out and dried for use. And he was really in earnest with his idea. But seriously, the best way to utilize sawdust is to make less of it. The thin-bladed saw, in gang or band, is the real saving of lumber, and the use of the circular, save as a slabber, will eventually pass away. In fact, such is largely the case already, and few mills of any size use their circulars to cut out the stock. This of course does not apply to the cutting of long timber or bill stuff, but only to boards. The great contention is now between the gang and the band saw, both of which cut a narrow kerf, where the heavy set circular cuts a wide one. The *Timberman* has no suggestions to offer in the way of utilizing sawdust, save in making less of it.



FLOOR PLANS FOR SUBURBAN DWELLING.

[See colored plate ; also details, page 5.]

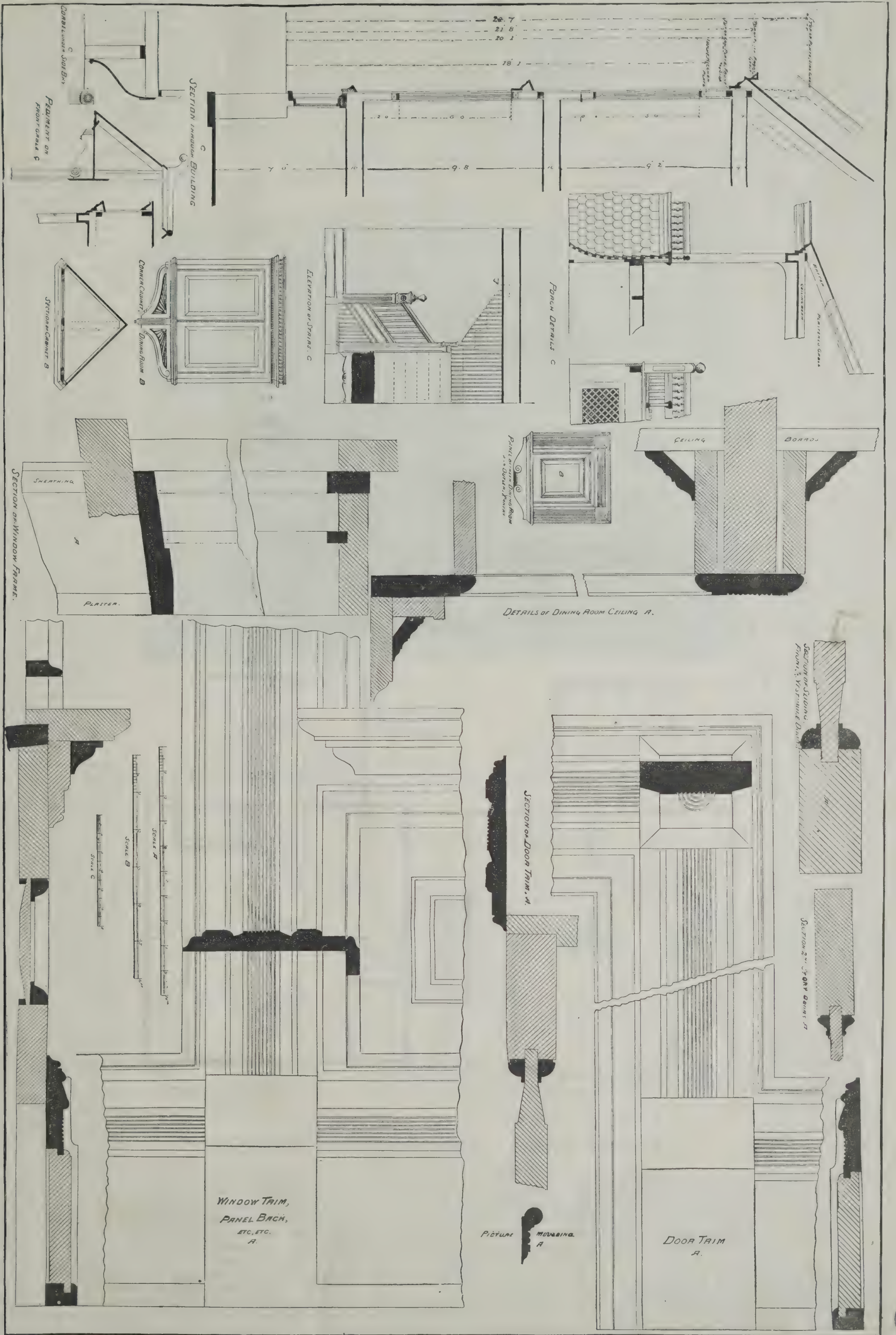




DETAILS FOR COTTAGE OF MODERATE COST.

[See colored plate; also floor plans, page 3.]





DETAILS FOR SUBURBAN DWELLING.

[See colored plate ; also floor plans, page 3.]



### A SUBURBAN COTTAGE AT FORDHAM HEIGHTS, NEW YORK CITY.

This attractive cottage was lately built in Sedgwick Park, Fordham Heights, for William D. King, Esq.

It is fitted up in the best manner, with all the modern improvements.

The underpinning is of local brick, and the exterior is shingled from water table to point of gables.

One of the most pleasing features of this cottage is the long lean-to roofs, which run low enough to form a roof for the porches.

There is a concreted cellar under whole of the house.

The rooms as shown by the plans are large and conveniently arranged.

On the first floor a spacious hall leads to parlor, dining room, and kitchen.

A handsome cherry stair case to second floor leads to four large bedrooms and bath room.

In attic there are three nice bedrooms and store room.

The house is heated by a furnace.

Gas is also provided.

The trim of this house is of cherry wood throughout except kitchen, which is finished in ash, being wainscoted three feet high.

The cost of this house was \$5,000, but it can be easily built for \$4,000 by having a good, but plainer, inside finish; and in some localities for less than this.

Our engraving was made direct from a photograph of the building.

#### The Chimney Shaft.

The chimney is not a feature that has been favorably regarded among architects. We all know when its presence was deemed a decided eyesore, and all kinds of expedients were adopted to hide it or to try and make it look like something else. Happily for the advancement of common sense and truthful architecture, these days are past, with much also in dress that was artificial and restrained. There is now just as much indifference about the form or shape it assumes. It either appears as a square lump of brickwork above the sloped roof or parapets bristling with chimney pots of divers heights and shapes, or is carefully arranged to appear at certain points, and to assume some definite architectural shape, as we find in buildings of Italian design. Express it we must, but how to do so pleasingly in every case is a problem. Two ways are open to the architect: The one is the artist's idea, based on picturesque effects, that the chimney should be allowed to come out anywhere so long as it groups with other objects. The other view is to make it conform to the architectural design by arranging that it should appear above the roof, where it will assist in the balance of the elevation, and in making it of certain proportions and form. The first of these methods is that of the Gothicism and follower of Queen Anne, or Old English, the latter the method in vogue among disciples of the more orderly schools of classical or Anglo-Italian architecture.

To the credit of the Gothicism it must be said that while making the chimney a picturesque feature, they gave it form and rendered it often during the Tudor period a highly pleasing object with the gables of their domestic buildings. The separate flues were expressed and united, and often a great variety of exterior ornamentation in cut and carved brickwork, and in moulded caps and bases, was to be seen, as may be noticed at Hampton Court Palace, and in a score of the old mansions of the reigns of Elizabeth and James. The shafts

are clustered, and in plan either squares arranged diagonally or octangular and circular. At Longleat and Wollaton are examples of the manner the Renaissance architects clothed them in classical garb and made them ornamental accessories. Directly the revival came all this was changed, and the houses of the early Georges betokened a desire to completely ignore the chimney. We have at last thrown off the mask of classic purism, and are free to build again as we like, yet there is little attempt made to study the chimney shaft as at one time was the case. There is a want of invention in the arrangement of the plan; the grouping among other features is often bad; they start out of ridges in awkward proximity to the gable, or flank a gabled roof, making it appear all flat chimney on the side.

out disfiguring the design, but the Italian shaft is spoiled at once by the addition. The physics of chimney construction are ill understood by the ordinary architect; or, if he does know the laws of gases and the action of the column of warmed air, he inadvertently builds an outer flue wall that conducts the heat rapidly away, or a long thin shaft, which, operating in the same manner, sends back the smoke; or some huge space over the fireplace, in which all kinds of eddies are at work, that completely nullify the effect of the ascensional force of the warm smoke in the flue.—*Building News.*

#### The Age of the Stars.

A very interesting address, delivered at the annual public session of the five academies of France, October 25, 1887, by M. Jannsen, the director of the observatory at Meudon, France, is published in full in the *SCIENTIFIC AMERICAN SUPPLEMENT*, Nos. 630 and 631. The principal thought is that the idea of evolution may be applied to the stars as well as to terrestrial things. The stars are not fixed and eternal, but are subject to change and time. They have a beginning, a period of activity, a decline, and an end. By recent advances in the study of celestial physics, especially with the spectroscope, we are enabled to know something of the actual condition and relative age of some of the stars. We may assume that the age of stars, other things being equal, will depend upon their temperature, and that their temperatures are higher in proportion as their spectra are richer in violet rays. The majority of the stars which are visible to the naked eye are white or bluish, and therefore at a high temperature; but many are yellow or orange, like our sun, showing that they have passed their youth, while others are from dark orange to dark red, showing that their sidereal evolution is far advanced.

#### Wood that will not Blaze.

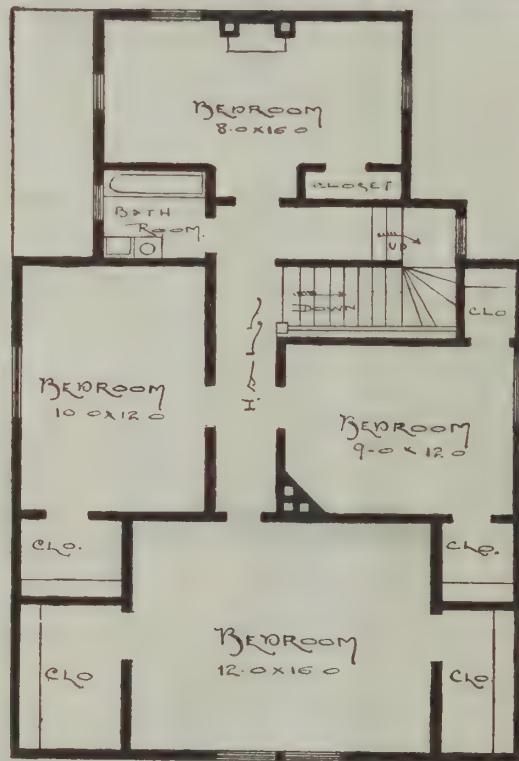
At the request of the Belgian Minister of Public Works, says the *Journal of the Society of Arts*, M. Boudin and M. Donny, professors at the Ghent University, have conducted a series of experiments and investigations in connection with rendering wood non-inflammable. The following resume embodies the conclusions at which they have arrived:

Although wood cannot practically be rendered so fireproof as not to be destroyed by heat, it is very possible to deprive it, to a considerable extent, of the property of catching and communicating fire, and to

this end it is sufficient to coat the wood with a suitable composition. It is not, however, sufficient that this composition or substance possesses in a high degree the property of rendering wood unflammable; it must also fulfill other conditions. The treatment must not involve an expense out of proportion with the purpose to which the wood is applied, nor should the process be such as to delay the rapid execution of the works, nor should the substance employed be liable to attack any metal parts which it may be necessary to use with the wood. The process should also be of easy application, with a brush, for instance—the only manner in which it can be applied to existing structures. The wood thus coated should present a neat and tidy appearance, and should also be capable of receiving a coat of ordinary paint over the fireproofing composition; nor should one or the other coat be subject to



FIRST FLOOR



SECOND FLOOR

A SUBURBAN COTTAGE AT FORDHAM HEIGHTS, NEW YORK CITY.

We see shafts octagonal in plan clustered together, start abruptly out of the ridge and roof slopes as if it had pierced the roof unpreparedly; others show heavy bases that stand saddle-back fashion over the ridges; some are top-heavy with mouldings, others unfinished at their summits. For square-built shafts the sides can be relieved by division into panels with cut-brick vertical piers between—a treatment resorted to by designers of the vernacular 17th century villas. We have at least common sense in this plain and unsophisticated chimney building; the shafts can be taken up to any desired height, and the higher they are, the more effective; they can be placed anywhere without being twisted or diverted from the original direction of the flues, and, being massively built, the evils of smoky chimneys are, to a large extent, avoided. This square-



alteration after a moderate lapse of time. It follows from the above considerations that wood cannot be rendered incombustible, or, more strictly speaking, non-alterable by heat; but its non-inflammability may, to a considerable extent, be insured, so as to preserve buildings from a limited and temporary fire—at any rate until assistance arrives. The methods of preserving wood against fire are of two kinds: The injection of saline solutions and the application of a paint or coating. The former appears but little practical. In the majority of cases coating with the brush is the only practical solution of the question, and the substances most to be recommended for use in this manner are cyanide of potassium and asbestos paint. We may add that the cyanide of potassium is a dangerous poison.

#### A QUEEN ANNE FOR \$1,400.

This quaint and pretty little "Queen Anne" cottage was lately erected on Monroe Avenue, Asbury Park, for M. T. Bird, Esq., at the cost of \$1,400, complete, ready for occupancy.

There is a concreted cellar under whole of house.

The underpinning is of local brick.

The first story on the exterior is covered with beveled clapboards, and the second story is shingled with the best quality of sawed shingles. The roof is covered with similar shingles.

The long lean-to roof runs low enough to form a roof for front porch, and also gives ample room for storage.

On the first floor there is parlor, library, dining room, and kitchen.

Pantry is fitted up with shelves, counter shelf, with closet under for flour barrel.

The hall is ample and contains a pair of easy stairs, with two landings; a pleasant window gives plenty of light.

There are three good sized bedrooms on second floor, fitted up with wardrobes, closets, etc.

The inside trim is of North Carolina pine throughout, finished in the natural wood. Furnace in the cellar, but is not included in the contract.

Our perspective was made direct from a photograph of the building.

#### Many Others Like It.

Dr. T. C. Hunter, of Napoleon, O., makes the following report to the State Board of Health of Ohio concerning the sanitary condition of that town:

We have no board of health and no health officer, as the members of the council seem to consider them expensive and useless appendages. They pay but little attention to sanitary science. We have as many privy vaults, cess-pools, and stables as are usual in county seats fifty years old. We endeavor to keep all the filth produced on and in the soil. It is true that we have a good deal of sickness from impure water, but think it cheaper to bury a few coffins than to clean up. When any one dies of preventable disease we piously say, "The Lord gave and the Lord hath taken away." We feel satisfied, as we know the Lord is long suffering and kind, and that He seems willing to bear all the blame. As the latter (of three sewers) is the pride of the town, I will describe it. It is eighteen inches in diameter, and extends about three squares, where it finds an immense catch basin. From the catch basin a two-foot sewer runs to the canal, two squares. The sewage is carried under the canal by a culvert three feet square, and thence to the river through a fifteen-inch sewer pipe. The catch basin is lined with brick four inches thick, and is deep enough to hold three hundred barrels of filth before it will reach the outlet. This will necessarily hold the amount of sewage all the time and give an opportunity to filter through the brick walls and thence reach the neighboring dwellings and wells. The joints of the sewer pipe are loosely placed together without cement of any kind. They are war-

ranted to leak at every joint. The cellars and privy vaults on the street are connected with the sewer by a six-inch sewer pipe. They are all made large, as we all know that the liquid portion will leak out at the joints and leave the solid portion to ferment and furnish an abundant supply of sewer gas for the use of the people. The water supply for the sewer is the rainfall on about forty acres of land. There never has been more water in it than would run through a four-inch pipe.

The subject of water works has been discussed a little within a few weeks on account of the discovery of an abundant supply of pure soft water gushing out of the gravel at the foot of the bluff on which our principal cemetery is located.

#### Bricks of Blown Glass.

We have already mentioned, says a writer in *La Construction Moderne*, the many applications of glass for building purposes, as exhibited at the last exhibition

stance, it is desired to use glass in vertical walls or ceilings with the object of lighting lower stories or basements. As applications of this kind have been rare, we are pleased when we have the opportunity of recording them. One of the latest instances of the employment of glass in this manner has been made by M. Falconnier, architect, of Nyon, Switzerland, who has used glass in the form of hollow bricks. These bricks are cubes of 10 or 15 centimeters on the side, set in grooved iron casings. The joints in cement or plaster are retained in a grooving hollowed around the circumference of each piece, and held by putty. The metallic lattice work, very useful in a wall where strength is required, may be discarded where the object is strictly decorative. One of the principal qualities of these hollow bricks is the isolation produced by the enclosed air, which can be replaced by other matter less conductive of heat and sound. Besides, with the hollow glass various decorative effects can be obtained

without the necessity of resorting to grinding or enameling, as it is very easy to coat the inner face with oil colors. M. Falconnier has also applied these hollow bricks at Lausanne, in attic decorations, and in the construction of balusters and verandas.

#### Turning and Polishing Marble.

Marble is cut with a thin plate of soft iron used as a saw, and supplied continually with water and sharp sand. Both the hand and machine power are used, and the cutting is carried on continuously in most marble works. The polishing is commenced by rubbing down the surface with sharp sand till it is perfectly flat. Finer sand is then gradually used, and at length emery, after which tripoli, the last polish being given with tin putty. The coarse sand is usually rubbed on the marble with a plate of iron. The polishing rubbers are coarse linen cloth. Water is required in every stage. Having chosen a piece of marble about the size required, and free from veins, vents, etc., to which

black marble is very subject, the first process is to level one face, and with a pair of compasses strike a circle round the outer edge, then with a mallet and pointed chisel work it roughly to a circular form. It is then ready for the lathe, and being fastened with a resinous cement to an iron chuck, it is screwed to the lathe spindle, and a very slow motion is given to it. The only tool used is a bar of fine steel about 30 inches long, being three-quarters of an inch square, drawn to a point and well tempered. This is forcibly applied to the marble, which it reduces to the proper form by slowly speeling off small pieces. After the correct outline is acquired with this tool, it is ready for the grinding process, the first being to apply a piece of coarse and hard sandstone with water (the lathe now having a rapid motion) until all the tool marks are ground out. A finer piece of sandstone is then used to remove the coarse scratches of the previous one, and so on with a few other and still finer

scratches are obliterated. This prepares it for polishing. A piece of cotton cloth, washed quite clean and well rubbed with flour emery, is applied to the marble and polishes it to a certain extent. A similar piece of cloth is then rubbed over with putty powder (white oxide of tin), which gives a very high polish. This is the method, with a few trifling variations, by which all kinds of marble are turned and polished. Fluor spar undergoes nearly the same process, but requires much greater care and skill on the part of the workman, as the spar, being composed of a mass of crystals, whose cleavage is in various directions, requires a more delicate manipulation than almost any other stone. Alabaster is a soft stone and can be sawn with a common tooth saw, and is turned and polished in a very similar manner to marble.—J. T. Hall.



— FIRST FLOOR —

— SECOND FLOOR —

#### A QUEEN ANNE FOR \$1,400.

of decorative arts. Thanks to the decrease in price of coal, and to the recent improvements in glass manufacture, the product is classed at the present time among the usual materials the architect employs. It is well known that the process of glass making is by melting or blowing. Sheets of polished glass from 14 to 30 millimeters in thickness are chiefly used for casings of walls in dining rooms, linings of bath rooms, water closets, or recesses requiring frequent cleaning. They answer the same purpose as pottery tiles or enameled bricks. Rough glass of greater thickness is employed as flagging for pavements for the purpose of forming a luminous flooring. It is then set by means of putty for cement in iron settings. Blown, in place of melted, glass can be advantageously used when lightness and transparency are preferred to strength, when, for in-



COTTAGE AT JEKYL ISLAND, GA.

We give from *Building* a perspective of an attractive cottage at Jekyl Island, Brunswick, Ga. Mr. Wm. Burnet Tuthill, architect, of this city.

Decorative Joinery.

There are certain desirable conditions to be observed in the selection of decorative woods for ordinary joinery—they must be not too expensive, must be easily worked without waste, straight grained, and have a good figure and color. In wainscot oak and Spanish mahogany there is considerable waste in conversion—hence their cost. One of the leading rules to follow in the artistic treatment of framed wood-work is to use the less expensive straight grained materials for the framing of the rails and stiles and the scarcer ornamental figured woods for the panels. As a matter of labor and conversion, this rule is generally followed; but the selection of the woods is determined rather by custom and the market than by artistic arrangement of the grain and color. Some of the Canadian pines, walnuts, ashes, and birches make very effective combinations of tint, and the cost is not much more than the best deals in ordinary use. We have seen very effective doors manufactured of red pine framing with bird's eye or curly maple panels; the white and red beech and ash go also well together with hardwood mouldings. More decorative effects than we usually find in mouldings, especially of the cheap machine run sort, can be produced by the employment of clean and sharp hardwood mouldings of different tone in joinery of the ordinary kind.—*Building News*.

DESIGN FOR A CARRIAGE HOUSE AND BARN.

The dimensions are as follows: Front, 45'; side, 34' 8", not including cow shed. Height of first story, 11' 6". Second story finished up in roof. Foundation wall, 12" brick. First story clapboarded; second story and gables, shingled. Roof shingled. Cellar under carriage room. There are three single stalls and one box stall for horses. Room for six or eight carriages. Large harness room. Two cow stalls conveniently connected, and good size man's room on first floor. The second story is arranged for a small family. The feed arrangements are located on the second floor, and conducted by chutes to the first floor.

Villas and Their Doorways.

When the building of a detached suburban house is contemplated—whether it be a simple cottage or a more ambitious villa—the first point to be decided is, of course, the position of the house as regards distance from the street. Cases are rare in which the configuration of the ground determines this question; most often it depends merely upon the size of the lot and the taste of the owner. In former days the house was usually placed quite near the street, such lawns and gardens as it might have lying in the rear—as we see, for instance, in the most dignified streets of

Salem and of countless smaller New England towns. To-day the more usual custom is to set the house well back from the street, leaving room in front for a lawn with trees and shrubs, and in the rear for a flower or fruit garden, and often a stable. Such an arrangement, consistently followed, is certainly the best as regards the general aspect of the street, giving it width and dignity and a pleasing combination of natural with architectural features. And it is probably best, too, as regards

clude it from the eyes of others. We may accept this arrangement, then, as the typical one for an American villa, and pass to the consideration of a question which deals with a matter almost as important as the position of the house itself. This is the question, Where should the main doorway of the house be placed? And it is so important because upon the answer to it will depend not only the plan of the house itself, but, to a great degree, the plan and effect

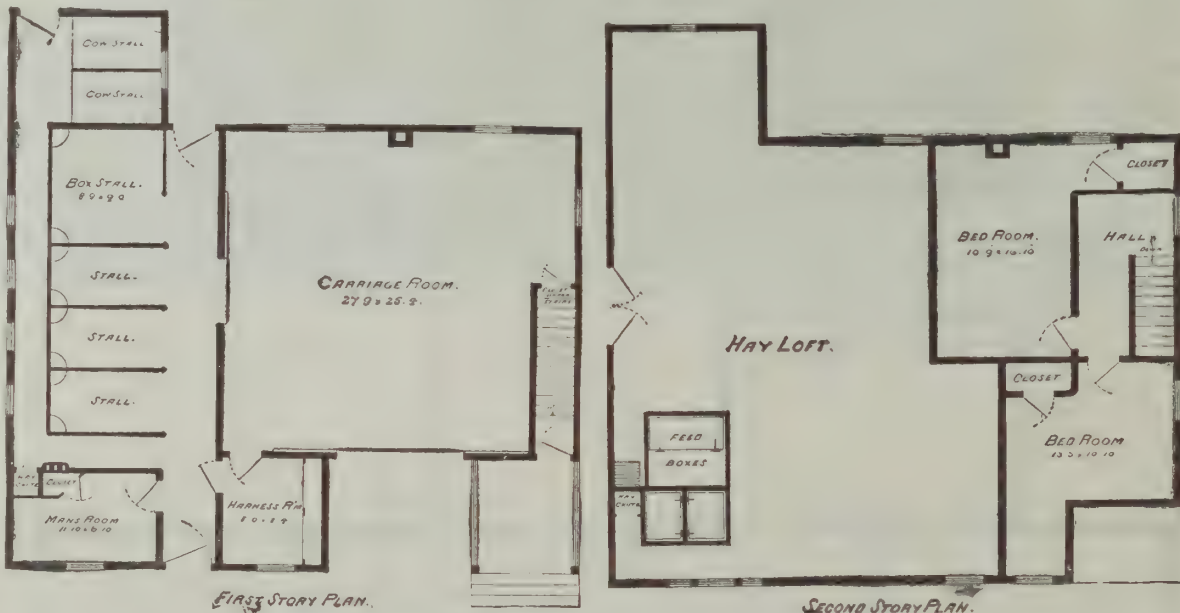
of the grounds as well. From the architect's point of view, it may almost always seem incontestably best to put the entrance in the front of the house, for especially in small and simple buildings he must depend upon it as one of the chief features in his design. Yet even at the sacrifice of a certain portion of architectural effect it may often be better to place it in a less conspicuous position.

A gravel or asphalt walk, intrinsically considered, is not a pleasing feature. It is simply a useful feature which should not be introduced unless necessity compels, and should always be kept as inconspicuous as convenience will allow. Whether it be straight or sinuous, its action is the same—it cuts up the ground into two parts, and too much thought and skill cannot be expended in lessening the injury to unity and breadth of effect which this fact implies. If the space available for a lawn between the house and the street is narrow, it is all the greater pity to cut it up with lines of gravel; and if it is wide, then it is still a pity to sacrifice the chance for beautiful gardening effects which it affords. Place the main doorway in the front of the house, and a path must, of course, give direct access to the street; and if horses are kept, the impulse will be to make the path a driveway, although the broader the line of gravel the more serious, of course, is the injury to the lawn.

It can hardly be disputed that unless grounds are so extensive as to merit the name of a country place rather than of villa grounds, a driveway should never be allowed to pass through them on the side toward the street. Whether the outlook is inward from the street or outward from the windows, it will injure the effect more seriously than any other feature that is likely to be desired.

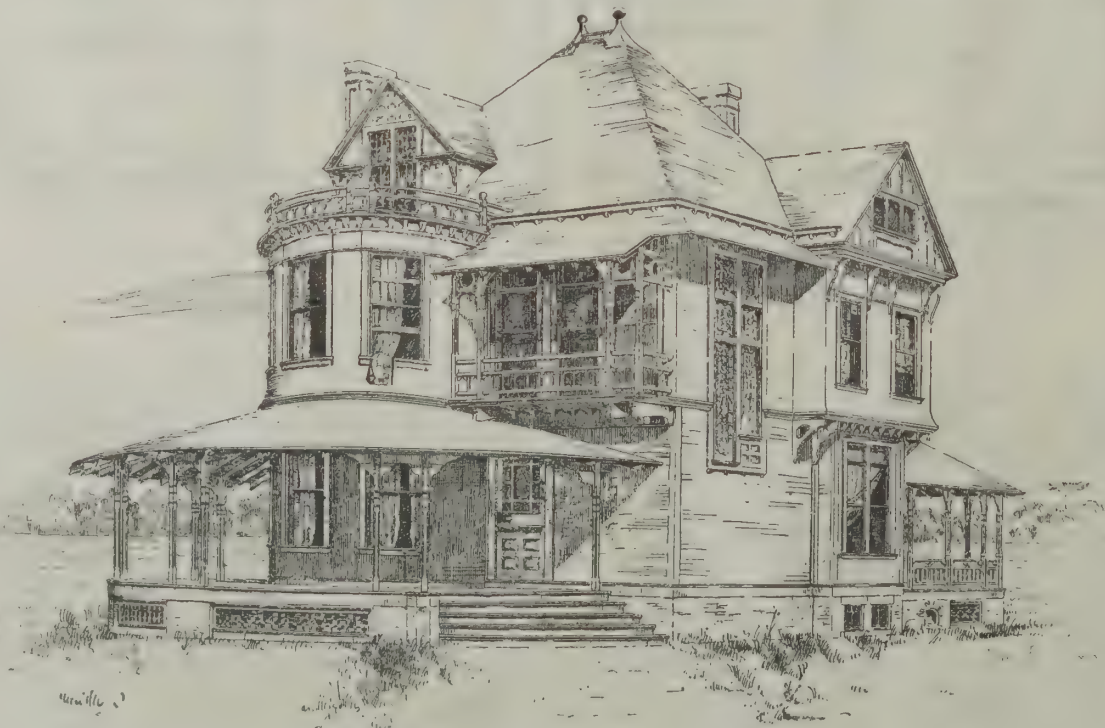
When horses are kept and a stable stands in the rear of the house, it is decidedly desirable, therefore, that the main doorway should be placed in the side of the house. Then all the drive required will be a single stretch, entering the grounds near their outermost angle and passing the door on the way to the stable. It need hardly be pointed out how much less offensive is such a drive than the one we often see even in very small grounds—cutting through their whole extent on the street side and then encircling the house to reach the stable, and often having an additional curve and an additional gateway to allow of entering and leaving the grounds without going into the stable yard to turn.

If there is no stable, but the necessity of having a direct carriage approach is nevertheless felt, the same



DESIGN FOR A CARRIAGE HOUSE AND BARN.

the comfort and pleasure of the average owner; for while it removes his windows from the immediate neighborhood of the street, it permits him still to take a contemplative part in the life of the street over a foreground green and pleasant to the eye; and this privilege is more valued by the average American than, for example, by the average Englishman, while he has not the Englishman's feeling that to enjoy his own private share of Nature's beauty he must carefully se-



COTTAGE AT JEKYL ISLAND, GA.



arrangement commends itself, of course, for the same reasons. But in such a case the necessity in question is much more apt to be fanciful than real. A short walk to the carriage is seldom uncomfortable, even to the feet, except in winter, and a narrow board walk, temporarily laid down over the asphalt or gravel, will cheaply do away with the greater part of the inconvenience that winter brings. Unless he keeps horses in a stable on the place, or unless there is an invalid in the family whose comfort must be the first consideration, an owner who cares at all for the beauty of his grounds will sacrifice his carriage approach without a pang.

Yet even if it is sacrificed there are still good reasons why the entrance should perhaps not be in the front of the house. If it is there, we repeat, a walk is still required, and the narrowest will still be a disfigurement to the lawn, and the smaller the lawn, the greater the disfigurement. The space to be traversed from door to

cases it will be well to consider its position carefully before the architect begins his design.—*Garden and Forest.*

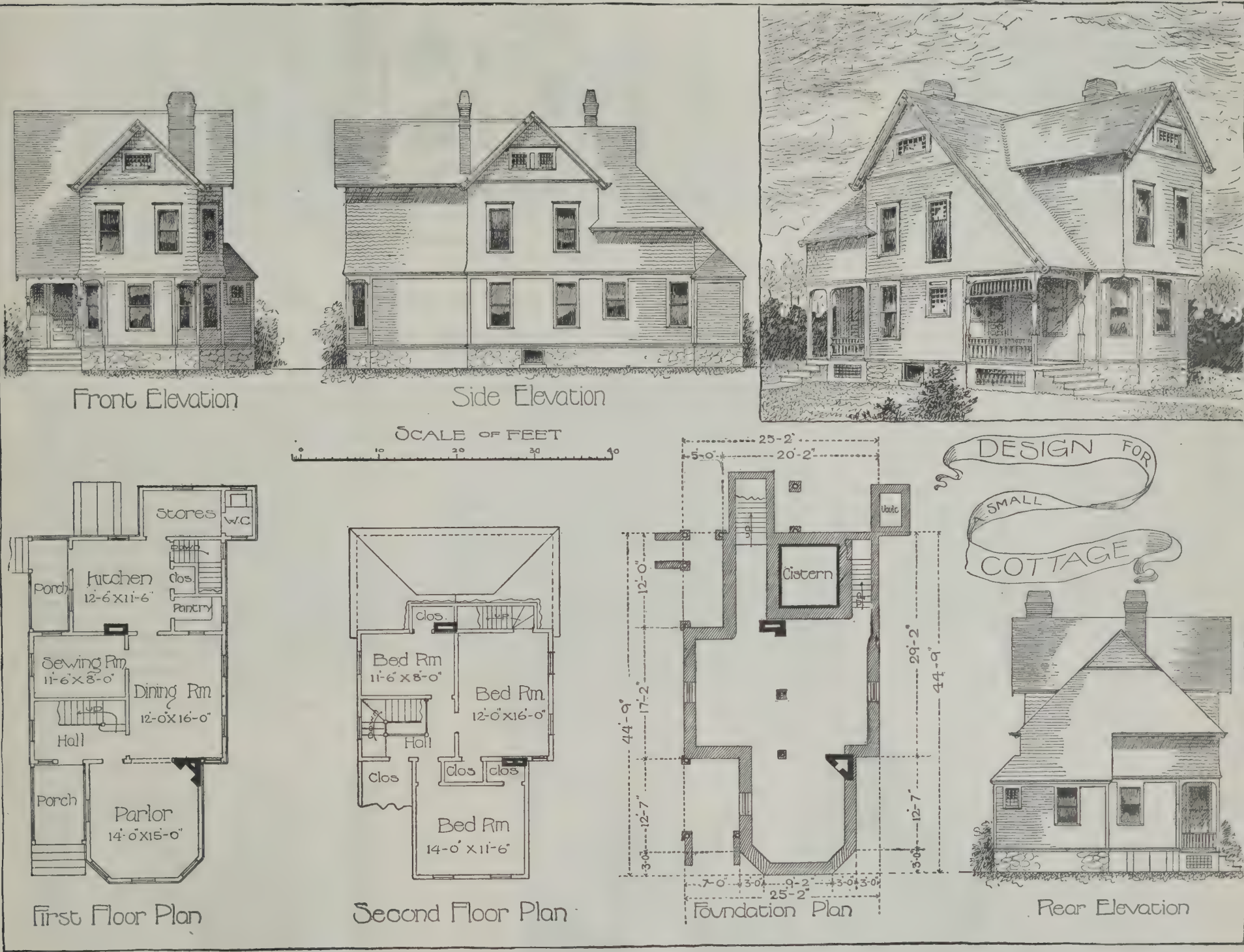
The Law of Trespass.

William and Ferdinand Setzke are cousins, and are the respective owners of adjoining lots at Thirty-first and Fox Streets, Chicago. Some years ago Ferdinand built a house on his lot, which encroached two feet and two inches upon his cousin's land. William verified this by a survey of the land after he and his cousin had had a falling-out, and at once instituted suit for possession of the strip pre-empted by Ferdinand. He recovered judgment for possession and refused to compromise except by getting his land. The case was fought bitterly. The Supreme Court decided that William was entitled to his land, and an order was entered directing the issue of a writ of possession. The writ was issued, but Sheriff Matson failed to execute it, and

"The defendant," said Judge Baker, "has the right to live in that part of his house which does not rest upon the plaintiff's land, and to live there his allotted threescore years and ten, but the plaintiff certainly has the right to do what he pleases with the portion of the building on his land. He may saw off two feet and two inches, provided he stays on his own land and does not trespass on the other's land, or he may cut a hole in the side of the house and enter upon so much of the premises as is built upon his land. You may hold that this would be a trespass, but I hold that it would not be, if he does not infringe on the defendant's property. The demurrer of the sheriff is overruled."

A \$2,000 COTTAGE.

This little frame cottage is one of that class of small cottages which is usually built for about \$2,000, and seems to suit the requirements of families in moderate circumstances. The first floor contains a parlor, hall,



A \$2,000 COTTAGE.

street will not be perceptibly lengthened by placing the door in the side of the house. No injury to the plan of the interior need result from the fact; for even if the door admits, not to an old-fashioned narrow entry, but to a hall which is used as a living room, a little ingenuity will suffice to make some of the windows of this hall command the front prospect. Again, unless the grounds are of much more than average breadth, the front of a villa is the best place for loggias or piazzas for the use of the family in summer; and such features are better adapted to their purpose when disconnected from the entrance and protected from the immediate access of visitors, while by carefully planting near the street line and the piazza, and carefully designing the piazza itself, it will often be possible to secure a due degree of privacy as regards passers in the street.

We do not say that there may not often be good reasons for choosing the front instead of the side of a villa as the place for the main doorway when a carriage approach thereto is not required, or that architectural effect intrinsically considered has not always a right to much attention. What we have wished to point out is that with small grounds the side of the house is decidedly the better place for the door when a carriage approach must be combined with it, and that in all

William secured a rule by Judge Baker to show cause why he should not be attached for contempt of court. The sheriff answered the rule by saying it was impossible for him to execute the writ without tearing down a portion of the house built by Ferdinand Setzke, or trespassing on his property. While it was admitted by the sheriff's attorneys that the plaintiff was entitled to undisturbed possession of as much of the defendant's building as encroached upon his land, the trouble seemed to be how to get there. The door of Ferdinand's house was on his own land, and the sheriff had no right to go through it without the owner's permission, which he could not get. If he entered the door, Ferdinand could legally defend his own property, and if need be shoot the officers, and the sheriff did not think the court would require him to take his life in his hand and make the attempt to enter the premises. The court cited a case in New York, where one man infringed upon another's land by building a brick wall an inch and three-quarters over the line. The other man secured a judgment for possession, but the trespasser coolly told the sheriff to go on and take an inch and three-quarters from the brick wall, but defied him to trespass another eighth, or even a sixteenth of an inch.

dining room, sewing room, and kitchen, with pantries, closets, etc. The room marked sewing room might be used either for a bed room or a library, if the occupants so desired. The second floor contains three bed rooms, besides hall and closets. The hall, stair case, and front door would be of oak, the rest of the interior woodwork of pine, finished in the natural wood. We are indebted to the *Architectural Era* for our engravings.

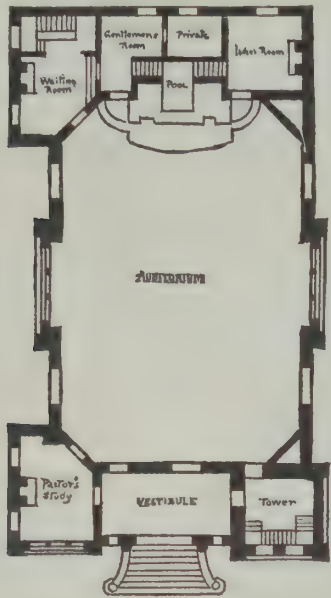
IN connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.



A CHURCH AT NASHVILLE, TENN.

We give from *Building* illustrations of the Christian Church at Nashville, Tenn. Bruce & Morgan, architects, Atlanta, Ga. It is in many respects a pleasing



edifice. May be built for from thirty to forty thousand dollars, or less, according to locality.

THE CHAPEL OF THE POCITO, MEXICO.

The village of Guadalupe Hidalgo (Mejeco) is situated about 4½ miles from the capital of Mexico, with which it is connected by a street car line on which the coaches run in about forty-five minutes. In this place is situated the famous Chapel of the Pocito, which was formerly a modest hermitage constructed in one of those places where, according to pious tradition, the Virgin Mary appeared to the young Indian Diego de Quanhtlan, in December, 1531. Indeed, the Bachelor Luis Becerro Tanco, the ancient chronicler of the apparitions, assures us that one of these appearances took place where an alum spring broke forth. This spring is the Pocito, and the primitive hermitage has been transformed into a beautiful chapel, which we here illustrate, from a photograph.

The original hermitage was built in 1649, many ladies and gentlemen of distinction contributing the means therefor, and it was dedicated to the Virgin Mary. The present Chapel of Pocito was begun in 1777 and

finished in 1791, at an expense of about \$50,000. It is about 100 feet long and 25 feet broad, surmounted by a handsome cupola. It has two entrances, one toward the west, where the spring is located, and the other on the southern side. It is a dependency of the College of Guadalupe. An inscription which exists on the interior wall states that the chapel was restored between the 3d of June, 1880, and the 9th of July, 1882.

The Pocito spring is located near the western entrance, and is a pool of turbid water saturated with carbonic acid gas, which boils up with considerable force almost to the level of the ground, and makes its exit through a subterranean passage. The depth of



THE CHAPEL OF THE POCITO, MEXICO.



A CHURCH AT NASHVILLE, TENN.

the spring is not known. It is covered with an iron grating about 3 feet in height, in the center of which is an image of the Virgin of Guadalupe. There is a chain, having a copper vessel at its end, by means of which the water is dipped up between the bars of grating. The water is considered miraculous, and the devotees use it for all classes of ailments. Every person who goes to the village partakes of the water without fail, although it is not very attractive on account of its bad taste.

LICH GATE OR ENTRANCE TO A CEMETERY.

This lich gate, erected at the entrance to the churchyard at Chorlton-cum-Hardy, has been put up by Sir William Brooks, Bart., M.P., as a Jubilee offering to the parish. The lower portion is of red brick and stone dressings, and the upper part in the old "black and white" work; all of solid oak, and covered with best red tiles. It contains eight tubular bells. This lich gate has been designed by and carried out under the



LICH GATE OR CEMETERY ENTRANCE.

superintendence of Mr. George Truefitt.—*Building News*.

If you want knowledge, you must toil for it; if food, you must toil for it; and if pleasure, you must toil for it. Toil is the law. Pleasure comes through toil, and not by self-indulgence and indolence. When one gets to love work, his life is a happy one.—*Ruskin*.





RESIDENCE OF JOS. T. ELLIOT,  
MIDDLETOWN, CONN.



RESIDENCE OF J. RICHARD SMITH, WATERBURY, CONN.



RESIDENCE OF SETH H. BUTLER,  
MIDDLETOWN, CONN.



RESIDENCE OF EDWARD S. DAVIS,  
MIDDLETOWN, CONN.



RESIDENCE OF W. S. WHITNEY,  
MIDDLETOWN, CONN.



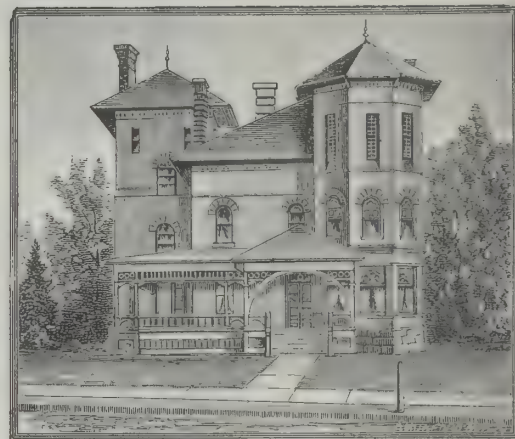
RESIDENCE OF JEFFERY O. PHELPS,  
SIMSBURY CONN.



RESIDENCE OF THEODORE COLSTON,  
HARTFORD, CONN.



RESIDENCE OF A. A. OLDS, HARTFORD, CONN.



RESIDENCE OF L. B. PLIMPTON,  
HARTFORD, CONN.



RESIDENCE OF W. H. RISLEY, HOCKANUM, CONN.



RESIDENCE OF GEO. TRACEY, WATERBURY, CONN.



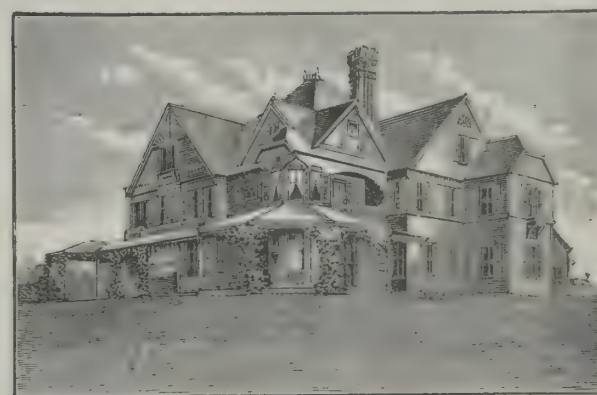
RESIDENCE OF J. B. WILLIAMS, GLASTONBURY CONN.



RESIDENCE OF DWIGHT LOOMIS, ROCKVILLE, CONN.

Some Residences\*——\*

\*——\*in Connecticut.



RESIDENCE OF R. O. CHENEY, S. MANCHESTER, CONN.



## A COTTAGE FOR \$1,850.

This attractive Queen Anne cottage was built lately at Summerville Avenue, Asbury Park, for Mrs. Ella Hamilton, at the low cost of \$1,850 complete.

There is a cemented cellar under whole house, furnace, etc. Furnace not included in above cost.

The first floor contains parlor, dining room, library, and kitchen.

The parlor has a very pretty hardwood mantel, with mirror.

The intention is to use portieres on first floor between the principal rooms.

Kitchen is fitted up in the usual way, and contains a pantry and closet, with drawers and shelves.

Back stairway from cellar to attic.

The hall contains a very pretty staircase of hardwood, which leads to four good sized bedrooms, which are provided with ample closet room.

There is ample room in attic for additional bedrooms, should they be desired.

The roof is covered with Maine slate.

The interior woodwork throughout is of North Carolina pine.

The casings are all beaded, relieved by black walnut corner block at angles.

The bay window on the left hand side is prettily shingled between the top casings of first story to the sill of second story windows.

The shingles are stained, and which adds a very pleasing effect to main body of house, which is painted a brown cream color.

Our perspective is made direct from a photograph of the building.

## Water for Household Use.

Cistern water should be filtered before used. Many cheap and effective household filters are made, and it is not necessary to go into detail concerning their construction; but a few practical hints may be given as to their care. A filter which is kept constantly under water soon becomes utterly worthless. The charcoal box should be frequently exposed to air, and, if possible, to direct sunlight. A filter removes suspended matter, and, on account of the air condensed in the pores of the charcoal, destroys to a certain extent the organic matter held in solution in the water. If any epidemic disease prevail at the time, it is always safest to boil any and all water used for drinking purposes. Cistern water may be boiled and then filtered. If one has no regular filter, it will be better at all times to boil the water, after which it may be allowed to run through a piece of filter paper, which can be obtained for a trifle at any drug store, placed in a tin or glass funnel. When filter paper is used, a new piece should be placed in the funnel each day.

The purity of surface water will depend on the condition of the soil upon which it falls and over which it flows, as well as upon the air through which it falls. Water which falls upon and flows over a filthy soil should not be used for drinking. Since the amount of refuse on the surface of the earth is usually greater in thickly settled countries, the water collected on such sheds is unfit for use. That there is a certain degree of purification in running streams there can be no doubt; but notwithstanding this, specific poisons have been carried long distances in rivers, and have still manifested their poisonous effects.

When any serious epidemic prevails, and surface water constitutes the drinking supply, it should always be boiled. In India, the spread of cholera is often along the watercourses, into which excrement from the sick and the bodies of the dead are often cast. Typhoid fever and dysentery are also often spread by the use of surface water.

The water collected in shallow wells is really surface water, and that often of the worst kind. The use of drinking water from shallow wells is, as a rule, to be condemned. Many people think if water percolates

order for the water to escape surface contaminations. Springs from gravel hills may be as impure as shallow wells. A very small amount of iron in water does not render it unfit for drinking; but water which contains more than one-tenth of one per cent. of iron is unfit for constant use. Deep wells should have their walls so protected as not to permit of surface water finding its way through them.

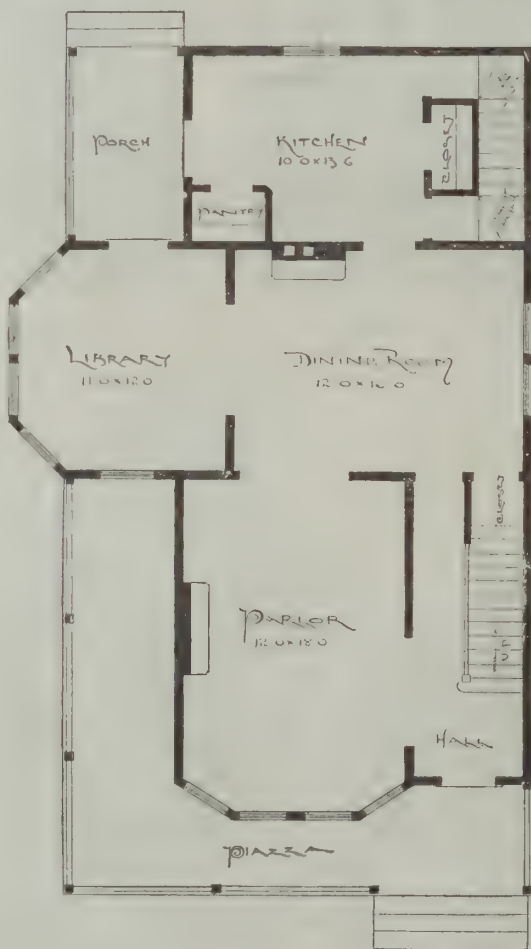
VICTOR C. VAUGHAN, M.D.

## Hydraulic Mortars and Cements.

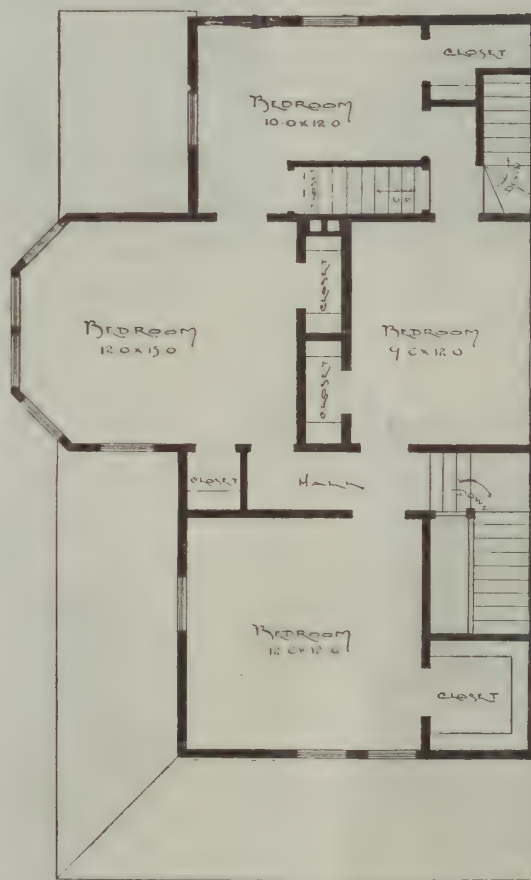
M. Le Chatelier, a French mining engineer, has published a monograph upon his researches into the constitution of hydraulic mortars, which contributes materially to the available store of information upon this important subject. The author discusses the hardening of mortars by the light of the principles of the mutual adhesion of solid particles, produced at a minute distance from each other, and the mobility of constitution which admits of their coming together during the period anterior to the final setting. Calcareous mortars are divided into the two classes—air-dried mortars and hydraulic cements. Air-dried mortar is typified in quicklime slaked with water and mixed with sand. As Vicat has shown, the first stage of the setting of this mixture is due to the desiccation of extremely fine particles of lime, and is identical with the hardening of clay by drying. The sand acts precisely as in the making of bricks; preventing cracks and excessive shrinking by forming an incompressible base or body. Later there is a further hardening, due to the progressive conversion of the lime into carbonate. Debray showed that the burning of limestone into quicklime is the result of dissociation, and consequently differs radically from the dehydration of gypsum into plaster of Paris. All kinds of lime become burnt at a temperature of 850° C. The hydraulic cements are mixtures of lime and clay; the proportion of the latter being from 21 to 27 per cent. The strength of cement is stated to depend upon the presence of a tricalcic silicate, which is the only anhydrous silicate of calcium that is attacked by water. There are three calcium aluminates, which all set very quickly after mixing with water; and there are ferrites of lime which slake and swell out like quicklime in the presence of water. Portland cement of good quality should not contain any free lime, although it may contain aluminates and ferrites which in a way imitate the action of lime. Microscopic investigations show, however, that it is the tricalcic

silicate which plays such an important part in the setting of hydraulic mortars.

If any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, containing full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.



FIRST FLOOR



SECOND FLOOR

## A COTTAGE FOR \$1,850.

through a few feet of soil, every harmful substance is removed. No greater mistake could possibly be made. Indeed, by percolation through the soil, the impurity of the water is often increased. Various kinds of filth which have accumulated upon and within the soil are dissolved in the water and carried into the well. Often we find in a small back yard a cesspool, privy vault, and well, all in close proximity. If the well be a shallow one, such an arrangement is probably the worst, in a sanitary sense, that could possibly be devised.

Subterranean waters used for drinking purposes are those obtained from springs and deep wells. Whether such waters are pure or not depends largely upon the geological formations in which they exist. The source of the water must be below rock or thick clay beds in



A ROW OF TWELVE HUNDRED DOLLAR HOUSES AT KINGSBRIDGE, NEW YORK CITY.  
This attractive and conveniently arranged row of four

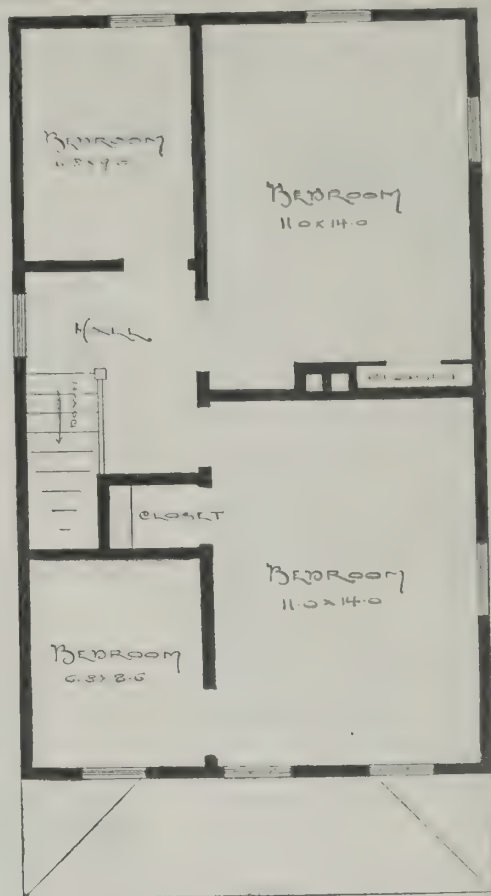
The kitchen has a rear entrance, with lobby, serving as a protection against the weather.  
On the first floor there are parlor and dining room,



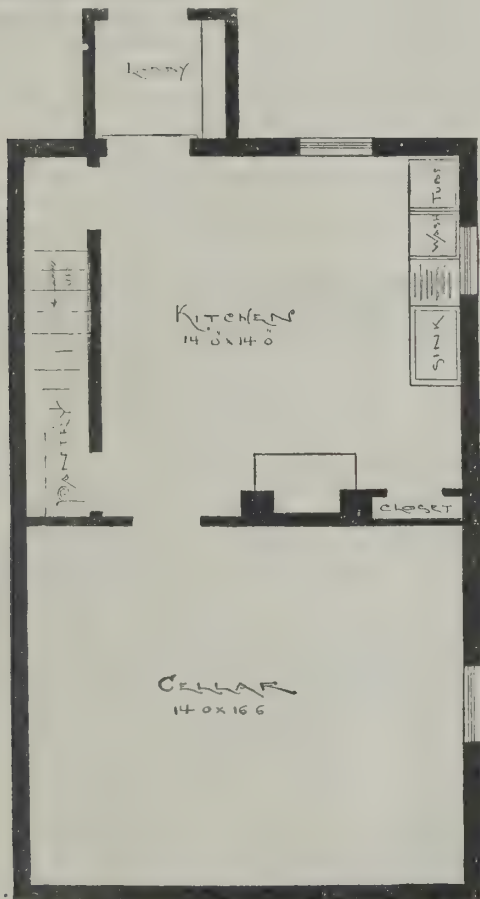
HOUSES AT KINGSBRIDGE.

houses was erected a short time ago at Kingsbridge, New York City, on Bailey Avenue.  
Mr. Godwin is the owner, and S. L. Berrians is the architect and builder.

with a piazza running across front, which adds materially to the front elevation.  
On the second floor there are four bedrooms, with numerous closets, etc.



\* SECOND FLOOR PLAN \*



\* BASEMENT PLAN \*

The rooms as shown by the plans are conveniently arranged, and contain all the modern improvements.

In the basement is a kitchen, 14x14, fitted up with wash trays, sink, and in front are coal and other cellars

The construction is substantial

The foundations are of stone, with underpinning of local brick.

The casings and trim internally are of white pine, painted in tints of two colors.

The kitchen and pantry are wainscoted with North Carolina pine and finished in the natural wood.

The pantry is fitted up with shelves and all the necessary hooks, etc.



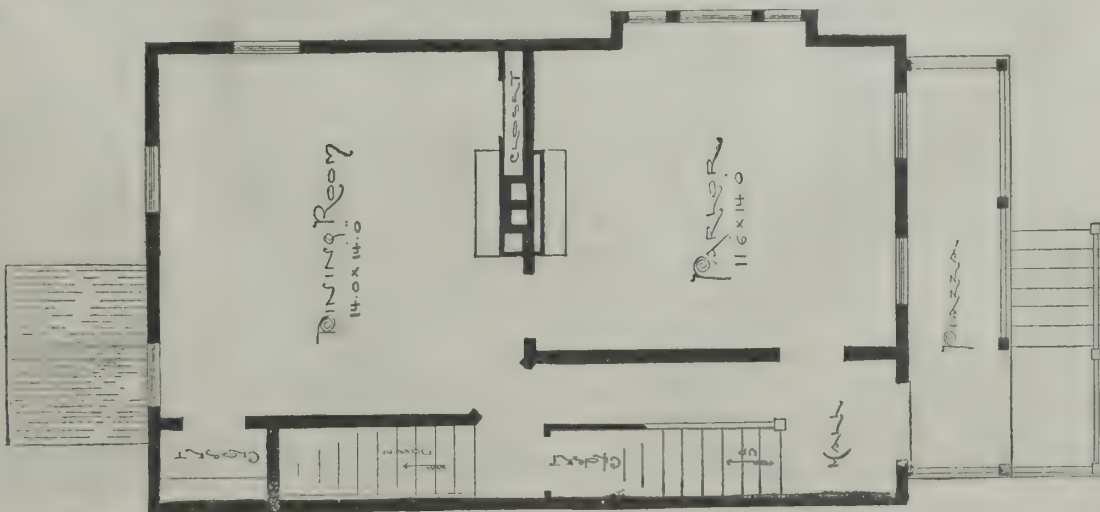
HOUSES AT KINGSBRIDGE.

The staircase running from first floor is executed in ash and finished in the natural wood.  
The houses are covered with beveled clapboards on the exterior.

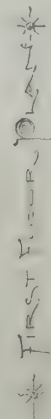
These residences cost twelve hundred dollars each

complete, but, with little plainer material, could be easily erected for one thousand dollars.

It is not often one finds such convenient houses, with well arranged plan and pleasing elevation, at such a low price as the above figures. Our engravings are made direct from photographs of the buildings.



A ROW OF TWELVE HUNDRED DOLLAR HOUSES AT KINGSBRIDGE, N. Y. CITY



#### The Durango Tunnel.

The great tunnel at Durango, Col., constructed in connection with the irrigation work for the Montezuma Valley, has been completed. The tunnel is over a mile long, through a spur of the Rocky Mountains, and into it will be turned the water of the Dolores River. There will be about fifty miles of canals, and about 200,000 acres of land will be irrigated and rendered available. The work was for the Montezuma Valley Water Supply Co.



**U. S. COURT HOUSE AND POST OFFICE, TROY, N. Y.**

The accompanying illustration shows the design for the new government building to be erected at Troy, N. Y.

The general design may be termed a mixture of Romanesque and Gothic. Material will probably be rough-faced limestone, with brick backing. The building is to be situated at the corner of Broadway and Fourth Street. Its dimensions are about 130'x150', about 40 ft. high to crown mould, with a tower 94 ft. high. The steep portion of roof will be slated. The deck of roof to be covered with tin.

The following offices find accommodation in the building.

**Basement.** Engine room, fuel and store rooms, office for storekeeper and water closet room.

**First Floor.** Occupied entirely by the post office department, accommodations being given for post office working room, money order and registered letter offices, also for the postmaster and assistant postmaster. This floor is of fireproof construction, the remainder of building being ordinary wood floors and roof.

The entire second floor, with the exception of two offices for internal revenue, is devoted to the court room (33'x43', 20 ft. high) and offices for court officials—judge, district attorney, United States marshal and clerks; also ample water closet room.

**Third Floor.** This floor can be utilized for jury rooms, document files rooms, and signal service, the latter service having accommodations in the tower for observation purposes, and also a flagstaff for display of signals. The total appropriation for purchase of site and construction of building is \$200,000.

The post office screen, entrance doors, etc., will be hardwood, natural finish.

First and second floor corridors will have marble tiling.

Post office work room and court room to have wood wainscot. All other interior finish to be of pine painted.

branches, and to give also ample vault and storage room.

The rear portion of the building is only one story in height, giving the advantage of skylights over the center of post office workroom, and windows along the corridors of second floor. A 900 gallon tank is placed in the loft for water supply of building, which will be obtained from the city reservoir. The architecture throughout will be strictly Oriental, the rich trimmings to be of copper and terra cotta. The body of the building will be of pressed brick laid in alternate courses of dark and light red. The window sills, water table, and base of building will be of brown stone. The second story will have long porticos on both street fronts with columns and Spanish arches of terra cotta, brick and stone balustrades and cement floors. The roof will be covered with red tile. The dome will be richly ornamented with copper trimmings. There will be a macadamized driveway to mailing platform, an iron fence around the lot, and the sidewalks of brick.

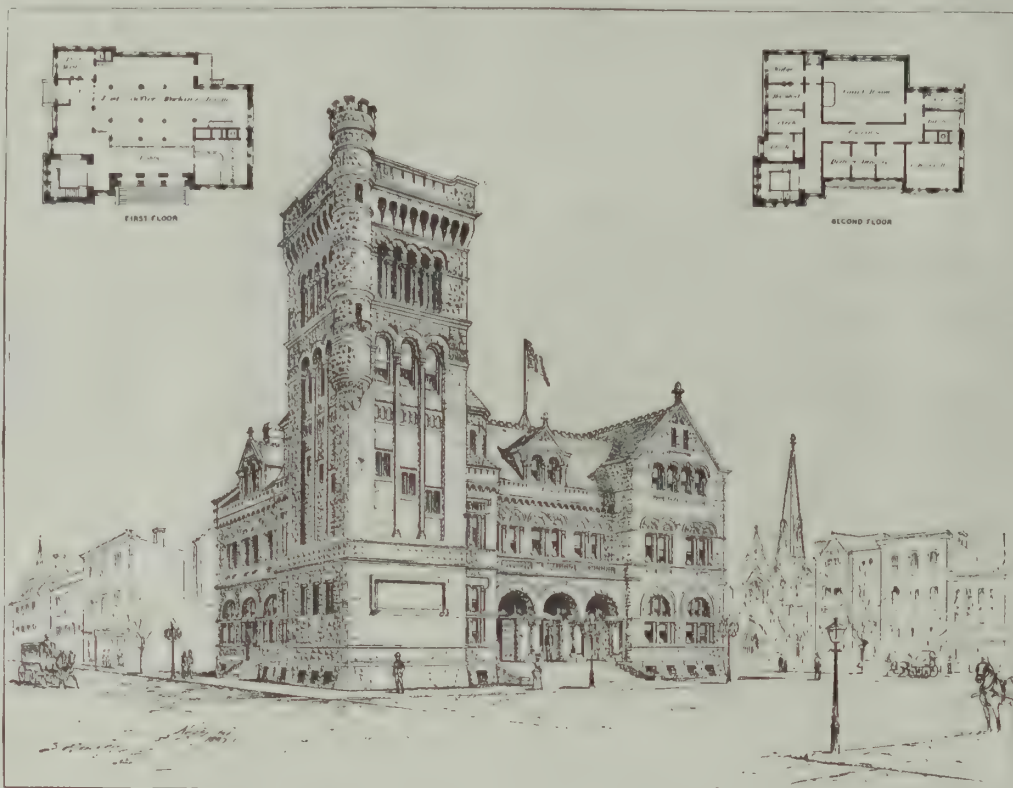
The post office screen, entrance doors, etc., will be hardwood, all other portions pine painted. First floor is fireproof and devoted entirely to the use of post office, with private offices for postmaster and assistant

postmaster, money order and registered letters.

Various government offices occupy the second floor. The signal service having a convenient office and also a platform on roof for observations and display of signals. The basement is devoted to heating apparatus, lavatories, store and fuel rooms, etc.

The amount of appropriation for the purchase of site and construction of building complete is \$75,000.

LA SCALA, Milan, is the finest theater in the world.



**U. S. COURT HOUSE AND POST OFFICE, TROY, N. Y.**

**THE NEW U. S. POST OFFICE BUILDING AT HOUSTON, TEX.**

The new building for the United States post office, etc., at Houston, Texas, will soon be under course of erection. It will be 60'x85', two stories and basement, with all the modern conveniences and improvements, well drained with private sewers, thoroughly ventilated and planned for steam heating. The arrangements for the post office working department have been carefully studied to facilitate the work in its various



**THE NEW U. S. POST OFFICE BUILDING, HOUSTON, TEXAS.**



THE NEW U. S. COURT HOUSE AND POST OFFICE AT WILLIAMSPORT, PA.

The design for the government building to be erected at Williamsport, Pa., is of the English Romanesque style of architecture, with center tower and end pavilions. The building is situated at corner of Fourth and West Sts., the main entrance being on Fourth Street. The general dimensions are 126' x 51'. The building will be faced with rock-faced ashlar. Roof to be slated and to have copper finials, dormers, etc. The first floor of fireproof construction. The entire first floor will be utilized for post office purposes, there being a large and commodious work-room and offices for money order and registry divisions, postmaster and assistant postmaster, ample fireproof vaults being provided. The corridors of first and second floors to have marble tiling.

Heating apparatus, water closets, fuel and store rooms situated in basement. The entire second floor is used to accommodate the courts and court officials, there being offices for judges, district attorney, clerks, United States marshal, and also a room for a law library, as well as offices for internal revenue purposes, jury and witness rooms. On this floor is situated the district court room, 31' x 46'. On the third floor will be the circuit court room, 23' x 30', offices for judge, clerk, district attorney, and jury and witness rooms, also water closets.

The Signal Service will have ample accommodations in the tower, and a pole will be provided for the display of signals. Entrance steps, mailing platform, etc., will be of granite. The ashlar facing of building of limestone. The post office screen and entrance doors will be hardwood, all other interior finish pine painted. The tower is 18' square and 91' in height. The post office working room and the two court rooms will have wood wainscoting.

The amount of appropriation for purchase of site and construction of the building is \$180,000.

THE NEW U. S. COURT HOUSE AND POST OFFICE, CHATTANOOGA, TENN.

The new building for the United States Court House

to be marble tiled. The interior arrangements have been well studied, and ample accommodation is provided for the various offices, as follows: First floor—Post office working room, offices for postmaster and assistant postmaster, railway mail clerks, money order and registered letter offices, public lobby and corridors.

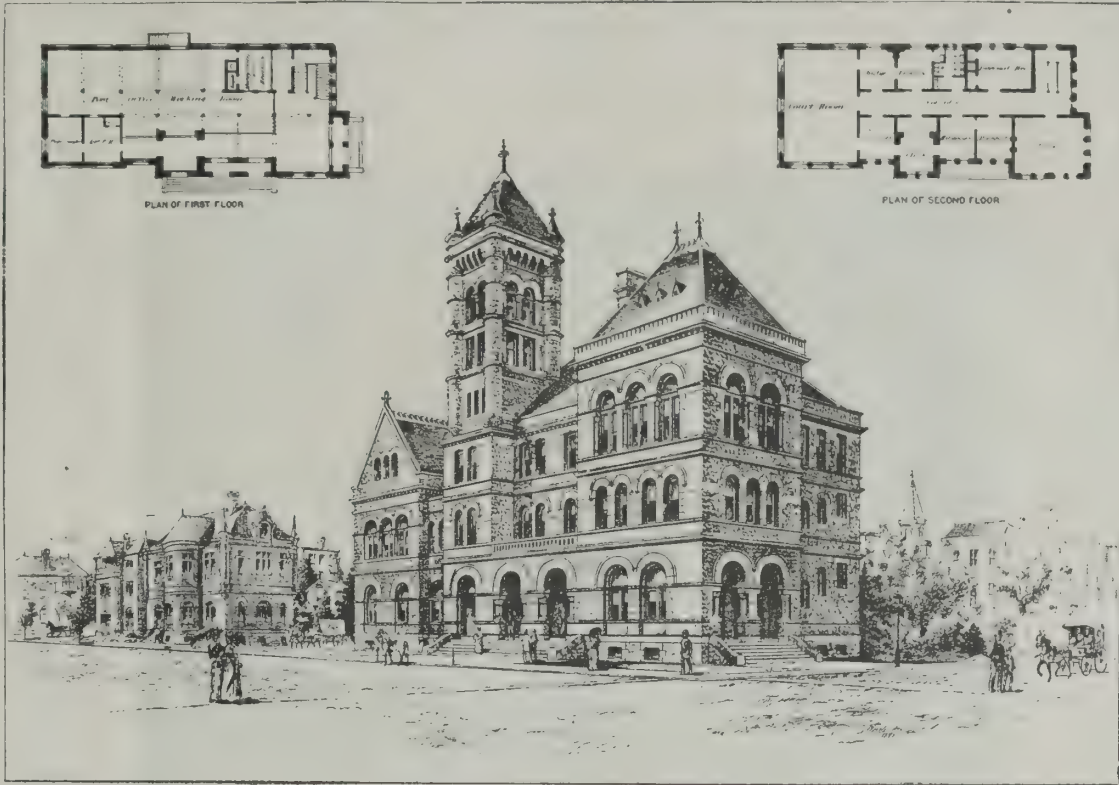
Second floor—Customs division, U. S. marshal and various other offices. Third floor—Circuit and district court rooms, offices for judges, clerks of courts, district attorney, and witness rooms. Fourth floor—Jury rooms, railway mail and signal service offices. The signal service also has ample accommodation upon the roof for observation and display of signals. The interior finish will be of a plain and substantial character throughout.

The amount of appropriation for purchase of site and erection of building is \$275,000. As the site was donated, the entire appropriation is available for the erection of the building.

Slate Bricks.

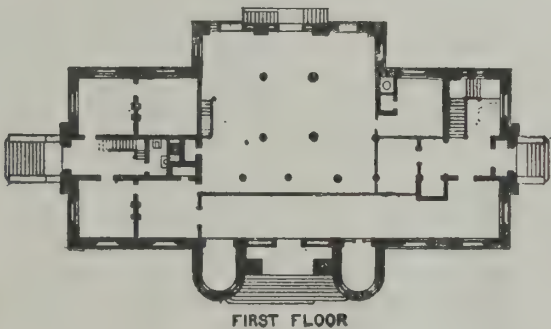
The bricks are manufactured from the crushed refuse of slate quarries in New Jersey. They are hard, compact, and of fine grain; they cost more than ordinary bricks, but are superior in strength and weight; their compressive strength is 7,200 lb. per square inch, as compared with 3,200 lb. for pressed brick and 6,000 lb. for stone.

They cost \$12 to \$20 per 1,000. They do not absorb so much water as other brick, and the water only penetrates about 1/4 in. from the surface. Samples of these bricks are being experimented with in the tests of the resistance of different materials to percolation of water with great pressure, which are being carried out as a preliminary to selecting the material to be used in the construction of the Quaker Bridge dam, New York.

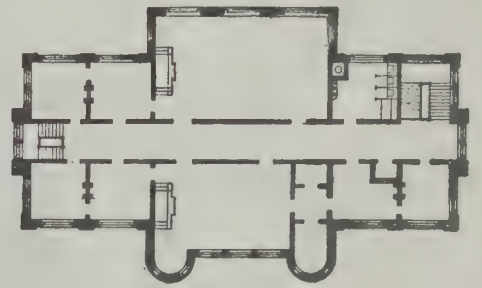


THE NEW U. S. COURT HOUSE AND POST OFFICE AT WILLIAMSPORT, PA.

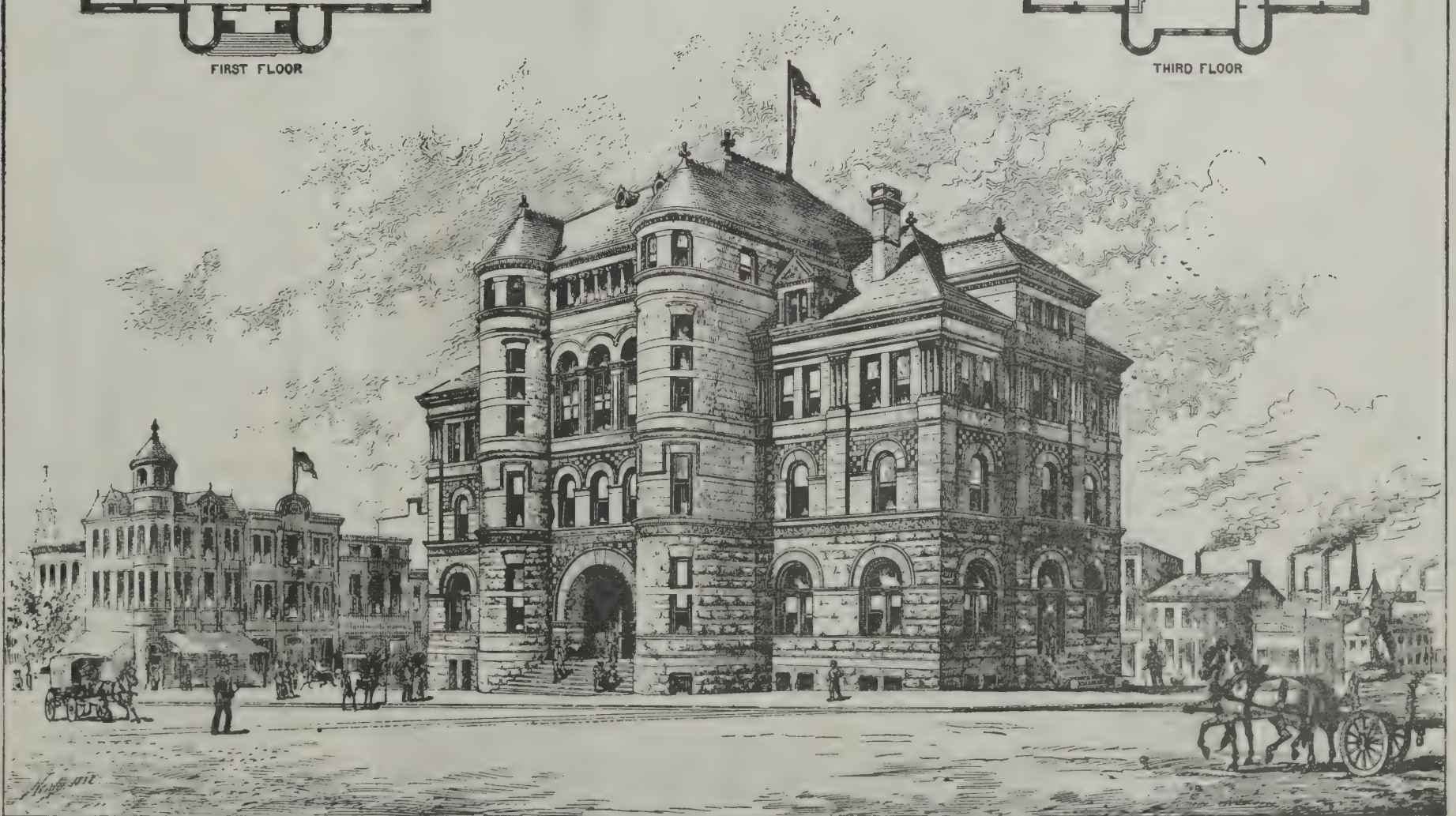
and Post Office at Chattanooga, Tenn., will soon be in course of construction. It will consist of a center building 54' x 83', four stories and basement, and two wings each 50' x 36', three stories and basement, to be entirely of brick with stone ashlar fronts, general style ornamented Romanesque. The interior construction will be fireproof, iron beams with brick or terra cotta arches being used for floor construction. The building will be provided with all modern conveniences, well drained and ventilated; heated by steam. To have elevator and two separate sets of iron stairs, affording easy access to all offices, etc. The corridors



FIRST FLOOR



THIRD FLOOR



THE NEW U. S. COURT HOUSE AND POST OFFICE, CHATTANOOGA, TENN.



## THE OLDEST COTTAGE AT ASBURY PARK.

We give, from a photograph, a view of the oldest house at Asbury Park. Those who admire the early colonial style of cottage of small expense have here an example that may prove suggestive. Our picture is reproduced direct from a photograph.

## Houses in Seville.

The houses of this town are perhaps the most picturesque in the world. You enter them from a porch, or "zaguan," to a court, round which are marble columns, and these are found not only in the principal, but even in ordinary habitations. The arches between the columns support galleries or rooms above. It is usual to inhabit the ground floor in summer time and the upper story in winter; in the former season a canvas veil is placed over the whole court during the heat of the day, and removed at night, when the family collect together to receive friends under the galleries or in the courts, while flowers are placed round a fountain which generally plays in the center, the courts being often paved with marble. The lamps which hang around the walls in symmetrical arrangement, the bubbling of the water, the fragrance of the flowers, the mystical green branches which spring up in every direction from large earthen pots, give an appearance of romance, which, added to the broken lights, the irregular architecture of the buildings, and the white Ionic columns of marble, present in every house a varying subject for the draughtsman or painter. To the sides of the walls are attached mirrors, which reflect all around, and pictures, among which were once found works of art that would delight the connoisseur. Now, indeed, from the all-invading gold of foreigners and the want of taste of the natives, the places of the best have been supplied by colored lithographs of the French and English schools. It has been calculated that 80,000 marble columns exist in Seville, but there assuredly must be a much larger number, for many are buried in the walls, others are covered with plaster, and on an average every house possesses six.—*F. H. Standish.*

## A \$400 COTTAGE.

This cozy little seashore cottage for summer use was lately built on Webb Avenue, Ocean Grove, N. J., for Job Emmons, Esq., at the low cost of \$400.

The underpinning is of local stone, in piers in equal distances apart.

If the reader will follow the plan, he will first find himself on a pleasant piazza running across the front of cottage. On entering the front door is a cozy little

living room, with a pretty bay window overlooking the sea.

Next to the living room is the dressing room, fitted up with clothes presses. To the right are two bedrooms. The dotted lines denote an archway, provided with curtains, giving a very pretty effect.

Further back is a good sized kitchen and a good sized pantry provided with shelves. Still further back is a shed used in summer for a kitchen, by having an oil stove, thus reserving the kitchen for a dining room. A staircase, with one landing, leads to two bedrooms on second floor, also to storage room in the rear.

retains unaltered in its apex the infant nucleus, to which successive convolutions have added size without altering its form. It is interesting to note in the different character of shells a resemblance to epochs in art. Some have a Greek simplicity, while in others we may detect the picturesque *bizarrerie* of the Rococo. It would be difficult to invent a new shell, so completely has every avenue of invention been exhausted by nature. Each development is worked out to the utmost practicable exaggeration; mere rudimentary prominences may be traced through a series of gradations till at last they become developed into spikes, whose tenuity and length are only limited by the weakness of the material or the impossibility of the animal existing with such inconvenient appendages. Fish seem to have been designed in the same exhaustive manner. We have fishes all head, and fishes all tail; or fins are developed till they resemble large wings, extending far beyond the vestige which marks the position rather than the existence of a tail. These extravagances and comicalities of nature are more especially instructive to the ornamental artist.—*F. W. Moody.*

## Ancient and Modern Mortars.

In a communication to the *Builder* on the composition of ancient and modern mortars, Mr. John Hughes, F.C.S., remarks that the superiority of ancient mortar over that of the present day is generally acknowledged, and that it has been supposed by many authorities that this superiority must be due to some special method of preparation. Without pretending to decide upon this point, Mr. Hughes places on record the results of a full and exhaustive analysis of some mortar taken from the interior of the walls of Corfe Castle. He compares this with an analysis of some mortar taken from one of the large modern buildings in the City

of London, and notes that the Corfe Castle mortar has nearly four times as much lime as the modern preparation. The older mortar also contains much less iron and alumina, appears to possess some of the chemical characteristics of a cement, and the sand with which it was mixed is more angular and sharply faced than the river sand used in the modern work. On the whole, Mr. Hughes draws from his investigation the general conclusions that in ancient mortar, such as that of Corfe Castle, a much larger proportion of lime was always used than is the present practice of builders; that its quality was superior; that the sand used for gauging should be as sharp as possible; and that rubbish of a clayey nature should be rigidly excluded from all mortar intended for use in the erection of buildings desired to be lasting.

## THE OLDEST COTTAGE AT ASBURY PARK.

This house is ceiled on the inside with North Carolina pine, with a heavy moulding broke around the ceilings of all rooms, and panels at bottom three feet high as dado.

It is not often one finds such a cozy little cottage at so low a price as \$400. Our engraving is made direct from a photograph of the house.

## Shells as a Decorative Element.

Shells afford valuable suggestions for ornament; they are constructed on one simple principle—addition to their margins. Between bivalves and spiral shells there is less difference than might be imagined—a slight deviation from direct radiation from a center—and what would have been a limpet or a part of a cockle becomes a turbinated shell. The full grown shell



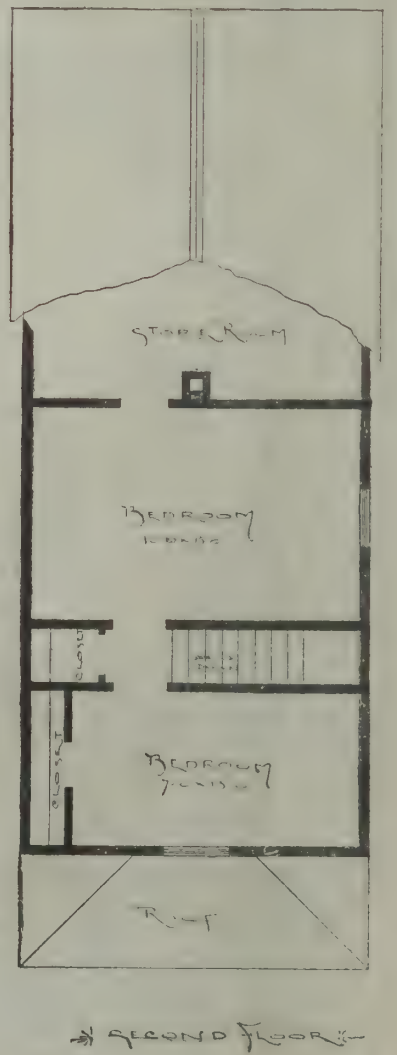
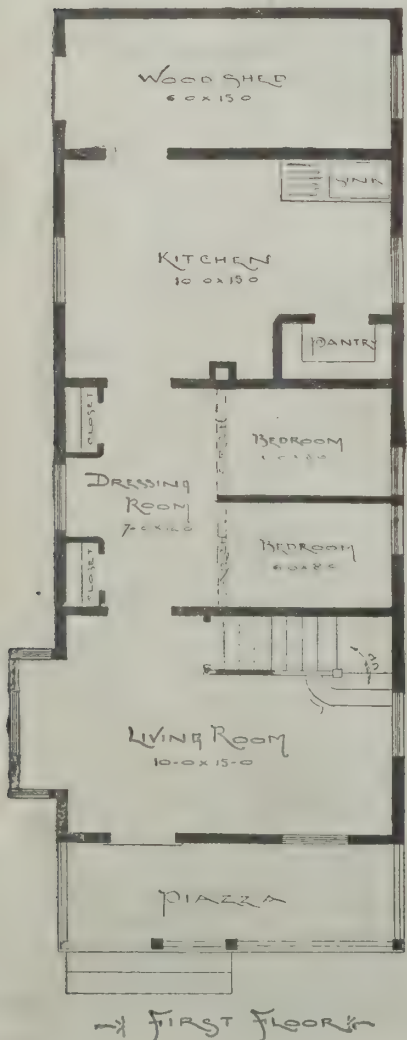
## THE OLDEST COTTAGE AT ASBURY PARK.

This house is ceiled on the inside with North Carolina pine, with a heavy moulding broke around the ceilings of all rooms, and panels at bottom three feet high as dado.

It is not often one finds such a cozy little cottage at so low a price as \$400. Our engraving is made direct from a photograph of the house.

## Shells as a Decorative Element.

Shells afford valuable suggestions for ornament; they are constructed on one simple principle—addition to their margins. Between bivalves and spiral shells there is less difference than might be imagined—a slight deviation from direct radiation from a center—and what would have been a limpet or a part of a cockle becomes a turbinated shell. The full grown shell



## A \$400 COTTAGE.



MODERN HOUSE AT A COST OF \$2,000.

This attractive house was lately built on Bangs Avenue, Asbury Park, N. J., for Mr. Charles Antonidus, at a cost of \$2,000.

The construction is of the usual kind, but thoroughly substantial.

Materials are of excellent quality, and the workmanship is the best. There is a cellar under whole of the house, which is cemented, and contains coal and wood cellar, besides a furnace room.

The exterior is covered with clapboards, and shingles are used in the gables.

A very pretty piazza runs across the front and returns to L on side.

On the first floor there are five rooms, including parlor, dining room, sitting room, kitchen, and sink room, also a hall at front entrance.

Parlor has a very pretty hardwood mantel, with glass mirror and an open fireplace with tile hearth.

There are sliding doors between parlor and hall and sitting room, and portieres separate parlor and sitting room.

The kitchen has a large pantry fitted up with drawers and shelves, also a closet for flour barrel.

Hardwood stairs lead to three good sized bedrooms, with closets fitted up in the usual way.

Three bedrooms are finished off in the attic, and there is ample room for storage.

The walls are neatly corniced, and a pretty flower

piece adorns the center. The interior woodwork is of whitewood throughout.

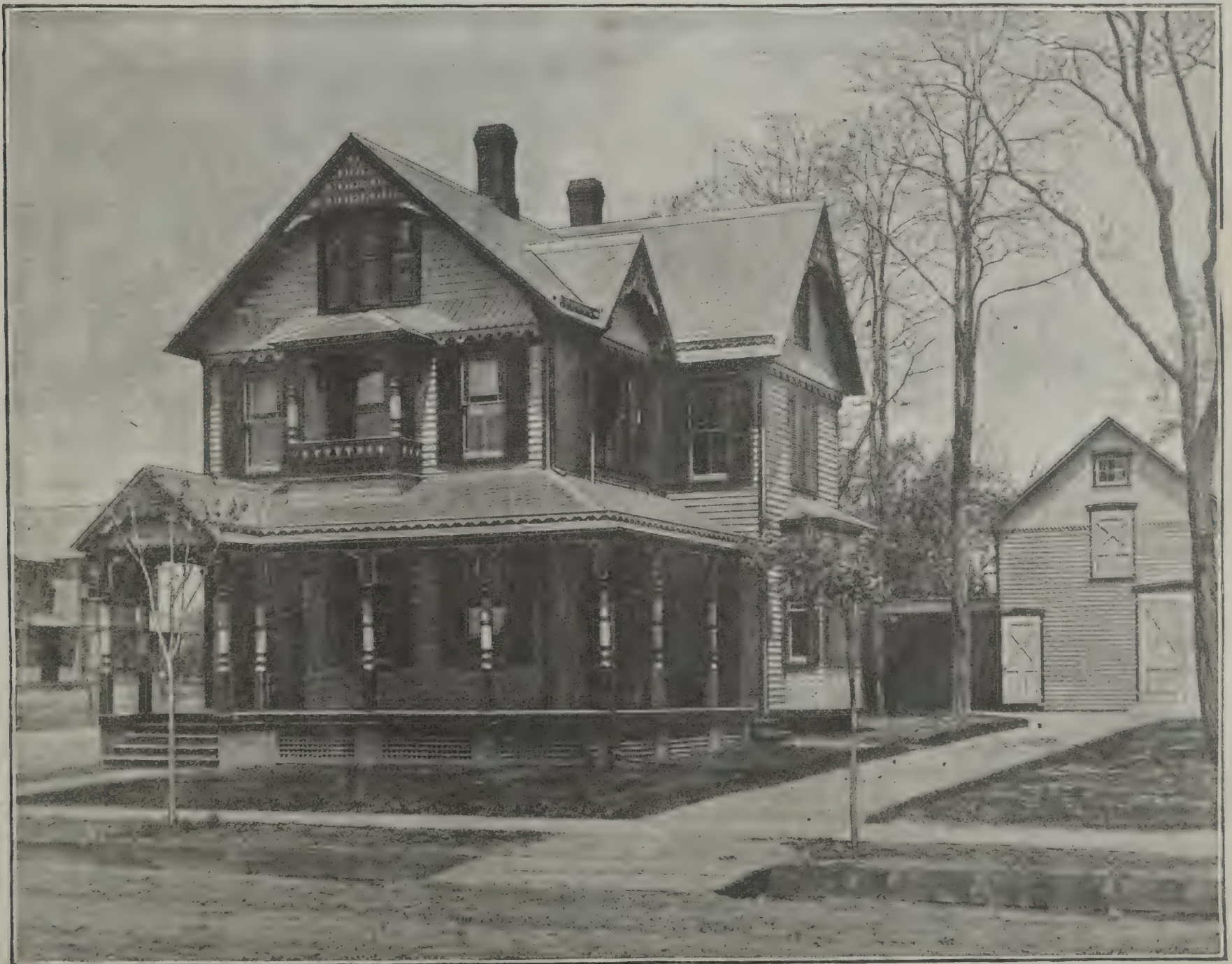
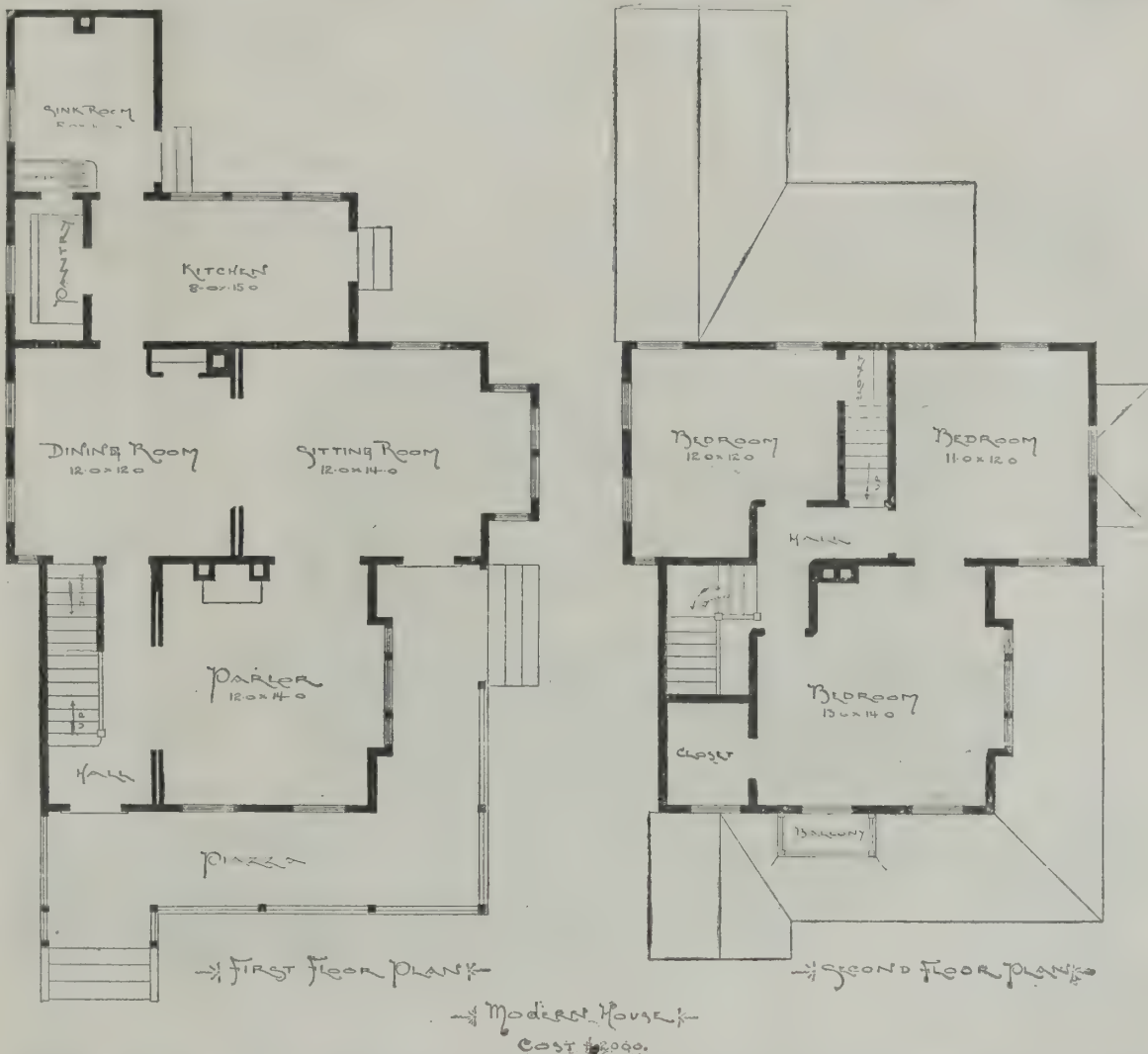
The door and window casings are beaded, and turned corner blocks are worked in at the angles and base blocks at the bottom, to stop base boards against. Slate roof. Furnace in cellar. One of the minor features of this house is the little flower balcony.

Our engraving is reproduced direct from a photograph.

Treatment of Hardwood Floors.

We have had some experience in the matter of hardwood floors, and have given no little attention to the subject. The treatment depends, in a large degree,

upon the use to be made of the room. The wood should be thoroughly seasoned and be laid in narrow strips. For kitchen and common sitting room raw linseed oil is the very best treatment. Hand rubbing is the best method of applying it, but it needs a great deal of muscular activity. The next best is a stiff brush, such as comes for this purpose, with an iron back and a long handle. This gives a dull, clean finish, and may be applied as often as the occupants choose. For a chamber where a little livelier finish is desired after the first dressing of oil, take two parts of linseed oil, two parts of alcohol, one part spirits of turpentine, and an ounce of ether to a quart of the mixture, and apply it briskly with a rag. Use this as often as needed. Where a higher finish is wanted, wax and turpentine make a good top dressing, and for a parlor, shellac is added. Most of the foreign floors are polished with wax and turpentine. The secret of successful application is a small amount of the dressing and a large amount of elbow labor.—*N. Y. Jour. Commerce.*



MODERN HOUSE AT A COST OF \$2,000.



## A COTTAGE FOR \$1,050.

This pretty cottage was lately built on Monroe Avenue, Asbury Park, for E. Haushe, Esq., at the cost of \$1,050.

There is a cellar under whole of house, which is cemented, and contains coal and wood cellars and furnace room.

The exterior is covered with clapboards, etc. A very neat and tasty piazza runs across front and turns the corner to L on left side.

The first floor contains hall, parlor, sitting and dining rooms, kitchen, and pantry, the latter fitted up with shelves and drawers.

The kitchen is wainscoted three feet high with North Carolina pine. Ascend a pair of hardwood stairs, and a passageway leads to three good sized bedrooms, with ample closet room, etc. Some additional rooms could be finished off in the attic if desired.

The window in hall on second floor gives light and ventilation.

The interior woodwork throughout is of North Carolina pine.

The door and window casings are beaded and turned. Corner blocks are worked in at angles, and base blocks are used at bottom to stop base board against.

The balusters and newels to stairs are prettily turned, and are of North Carolina pine. All finished in its natural wood.

Our perspective is made direct from a photograph of the house.

[GARDEN AND FOREST.]

## A Selection of Lilies.

The selection of varieties is an individual work to be settled by the grower in accordance with his personal taste and the amount of space and money he has at command.

For a garden of moderate size the twelve species and varieties named below would well represent the whole family and furnish continued bloom from June until September.

*Lilium auratum*, the golden banded Lily of Japan, is one eagerly sought, because of its large, showy flowers. As a garden flower it has few equals, if magnificent display is the object sought. As a cut flower for house decoration it is the least desirable of any of the family. It is too large to arrange with others, with a due regard for harmony of form and color, and the fragrance it exhales is truly sickening. Of this species there are many garden varieties, differing only in the markings. In some the golden band gives place to one of bright crimson, which for a day is showy, but the crimson soon fades into a dirty brown and the beauty of the flower vanishes. None of these varieties equals the original type. This is usually considered a difficult subject to manage. Choose the smallest bulbs, those that are heavy and firm, plant deeply, say eight inches, in the driest part of the border, in partial shade, and the bulbs will last a number of years.

*L. elegans* is sold in many forms under the name of *L. Umbellatum*, and its varieties, *atrosanguineum*, *fulgens*, etc. Orange is the predominating color, with various shades; a few are deep crimson and quite showy; some are a clear citron in color; some are self-colored, others deeply spotted. Alice Wilson, a variety of recent introduction, is decidedly the best of its class. The flower is perfect in form, with petals broad, full, and gracefully curved. Its color is a clear lemon yellow, deepening toward the center of the flower to a rich golden yellow. The class is valuable, because of

earliness, hardness, and profusion of bloom. A large clump makes a magnificent display. The flowers are generally too coarse for table or parlor decoration.

*L. Brownii*, which is also known as *L. Japonicum*, a native of China, is remarkable for its long trumpet-shaped flowers, ivory white inside and dark purple on the outside. This is usually regarded a tender lily, and is not much grown because of its liability to perish. This opinion is quite erroneous. I know a clump of more than a hundred bulbs, all of which have come from six bulbs planted some ten years ago in a raised bed, which has not since been disturbed. Many of the bulbs furnish eight flowers each, and the display is such as only this stateliest of flowers can make.

ing, with reflexed petals of a delicate nankeen color, with the minor petals covered with darker warty spots. Its fragrance is delicate and pleasing.

*L. speciosum*, or, as it is more commonly known, *L. lancifolium*, is the most useful of all the lilies. In point of beauty it ranks next to *L. candidum*, and is far more useful when cut. Of this species we should not be content with less than four varieties. Var. *præcox* is a strong grower, producing when well established twelve to fifteen very large, pure white flowers on a single stem, with regular and much reflexed petals often clasping the stem; in the center of the flower the petals are studded with delicate little projections, like crystal points. Var. *purpuratum* has the same general

habit, but is a taller and stronger plant, with dark rose-crimson flower whose petals, at the base, are seemingly rugged with rubies and garnets, while the edges are bordered with white. Var. *punctatum* differs in habit of growth but little from those already noticed, its flowers being pure white, delicately studded with light rose-colored spots. Var. *roseum*, or *rubrum*, is the most common and best-known of all the varieties. Much confusion exists in regard to its variety name. Some dealers call it *roseum*, others *rubrum*, many send it out under both names. The result is, if you buy one you have both, if you buy both you have but one, which one it matters but little. Its color is between that of *L. punctatum* and *L. purpuratum*. There are nearly fifty varieties of this species catalogued; the four described are fairly representative, and for a general display no more are required, while for a good collection neither could well be omitted.

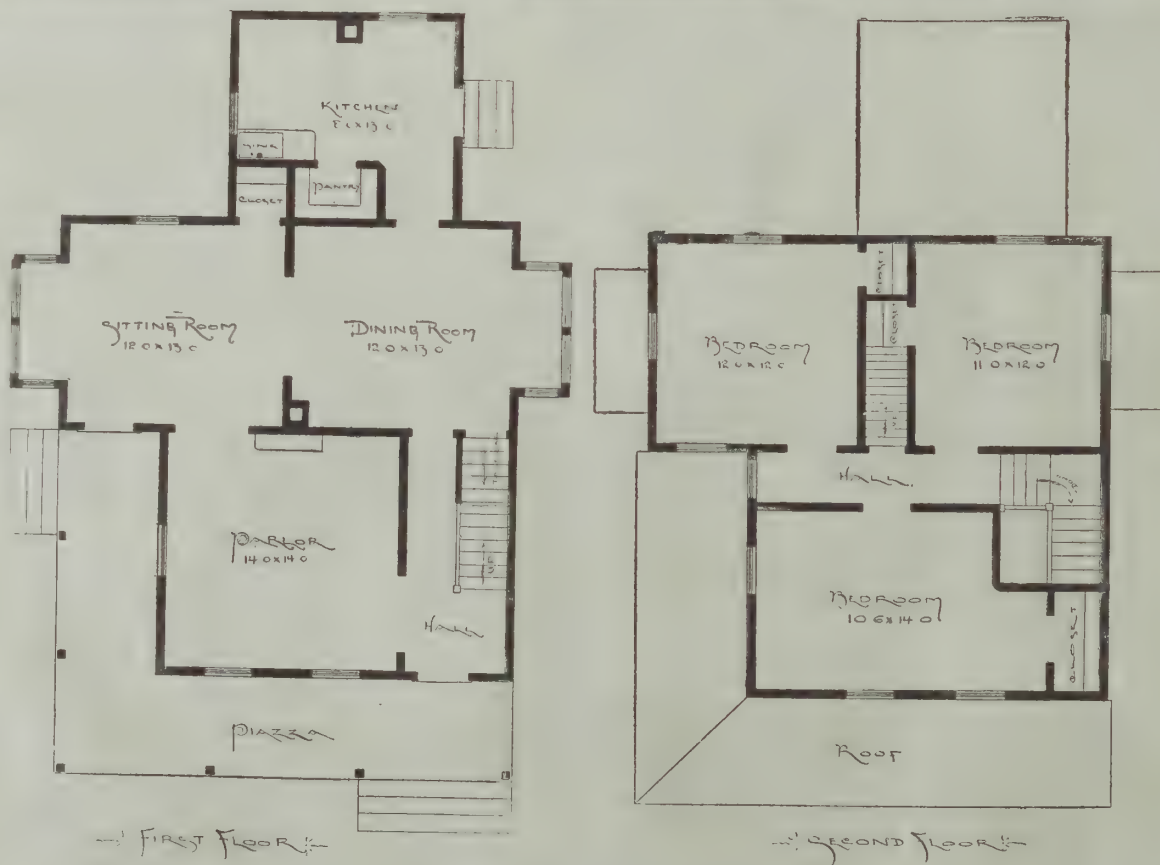
*L. longiflorum*, the trumpet-shaped lily, is conspicuous among Easter flowers, as it is well adapted for forcing. The popular Bermuda lily belongs to this species. It thrives well in the open border, but it is folly to plant it unless thoroughly protected against frost.

*L. tenuifolium* is the earliest of all lilies to bloom in the open border and one of the most remarkable, because of its brilliant scarlet flowers, borne in terminal clusters on very slender stems, which are beautifully clothed with grass-like foliage.

*L. tigrinum flore pleno*, although one of the much despised tiger lilies, is, when well grown, a noble and beautiful plant. I have had a single plant grow more than five feet high, with a diameter of more than three feet, bearing in a single season more than sixty flowers, and continuing in bloom fully six weeks. The flowers are orange-scarlet and very

double. Finally, let me say that in making a selection one cannot well go wrong, for there is not a species or variety that is unworthy of a place in the garden. You will succeed if you deserve success, and you will be sure to increase the number of varieties annually. You will also observe that your investment has been relatively small, as plants that are steadily and rapidly increasing in number, though they may cost one dollar each when you begin, are, in the end, much cheaper than those that require to be removed every year, like all the popular bedding plants.—C. L. Allen.

FULL plans, specifications, and details, complete, ready for the builder, for any of the buildings illustrated in these pages, may be obtained, on moderate terms, by addressing MUNN & Co., 361 Broadway, New York.



A COTTAGE FOR \$1,050.

*L. candidum*, the old and well-known white lily of our gardens, is the one we could least afford to lose. For graceful habit, stainless purity, and delightful fragrance it has no peer. It is fitted for any place, and for all occasions where cut flowers are desirable. It is about the only flower we do not like to cut, and that because it is too noble and pure to meddle with. This bulb should be removed in August, and not be suffered to remain long out of ground. It commences its autumn growth the last of August, and upon this growth its next year's bloom depends. A blight has visited the lily in many parts of this country, the cause of which no one has been able to discover, neither has there been found for it a remedy.

*L. excelsum*, or *L. staceum* of many catalogues, is another noble lily closely allied to the *L. candidum*, and resembling it in habit of growth. Its flowers are droop-





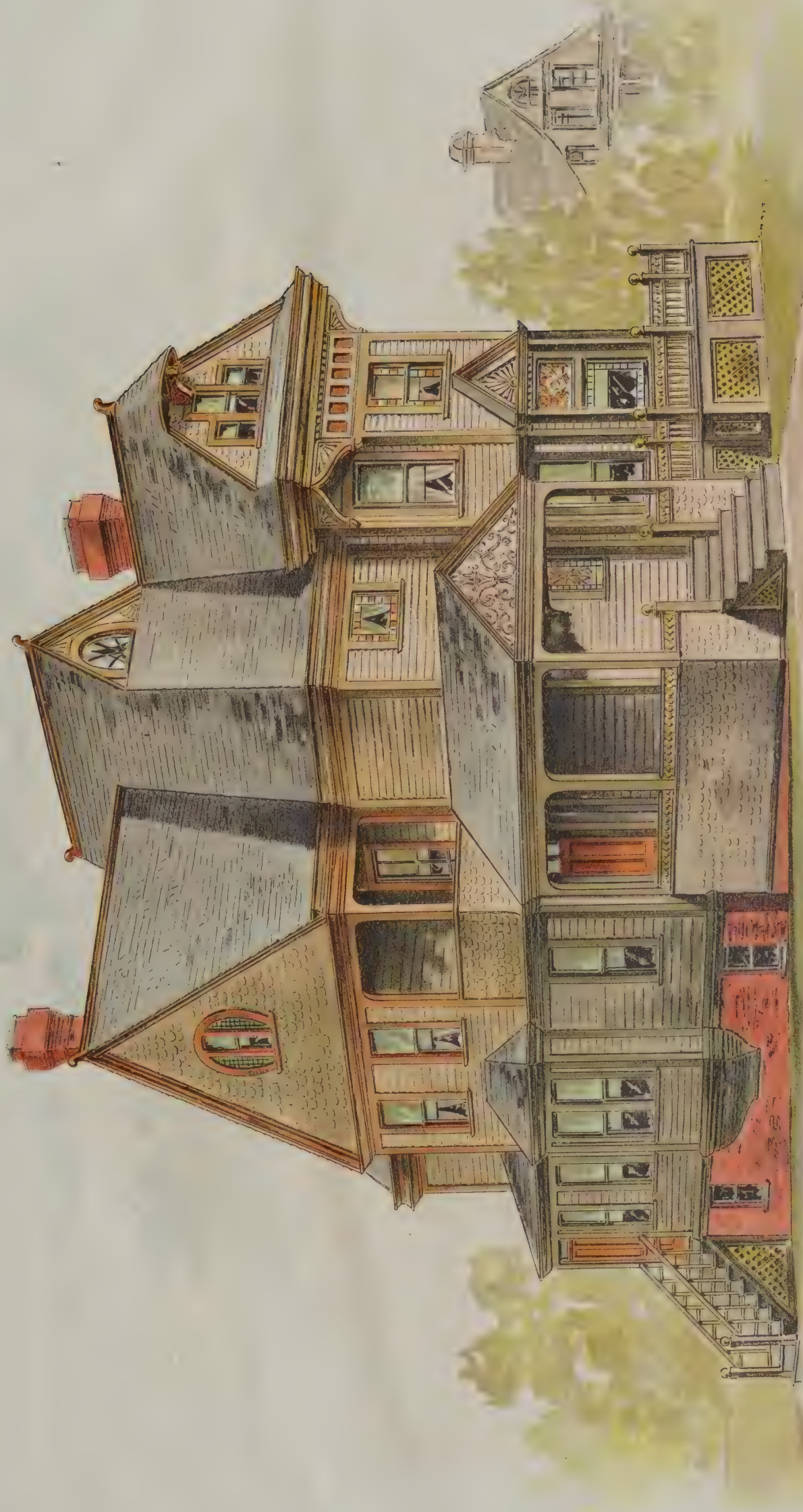




↔ A Cottage of Moderate Cost. ↔

Supplement to the Scientific American-Architects and Builders' Edition, July, 1888.





❖ A Suburban Dwelling. ❖

Supplement to the Scientific American-Architects and Builders' Edition, July, 1888.







A PLEASANT COTTAGE.

Our illustration represents the perspective view and first and second floor plans of a six room cottage, which is estimated to cost from \$1,800 to \$2,000. The extreme length is 40 feet, the extreme width 32 feet, the depth of cellar under main house seven feet. The house is planned to meet the demands for a few large rooms and to show what may be done in this direction in story and a half cottages. Frank L. Smith, architect, Boston, Mass.

THE NEW UNITED STATES COURT HOUSE AND POST OFFICE, OSHKOSH, WIS.

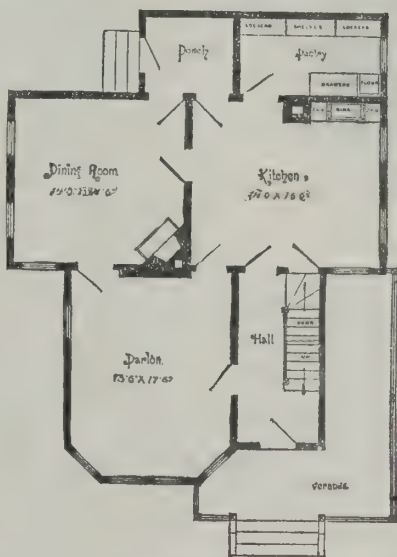
The illustration below represents the Federal building to be erected at Oshkosh, Wis., the design of which, together with all working drawings, have been under the direction of Will. A. Freret, supervising architect, United States Treasury Department.

The design is in a modified Romanesque style of architecture, while the well proportioned tower, gables, and dormers not only add to the general appearance, but also give the character of a public building. The structure is to be fireproof, the material used pressed brick, with stone trimmings. The roof will be slated.

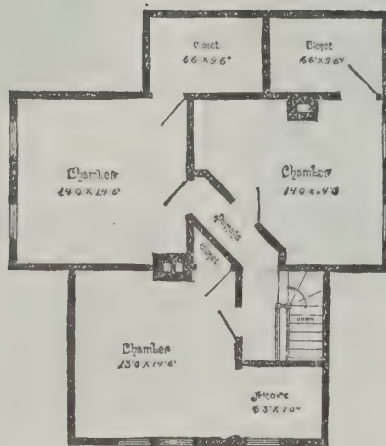
The entire first floor will be occupied by the post office department, comprising a large and commodious workroom and also rooms for the money order and registered letter divisions, also postmaster's office.

On the second floor will be located the United States court room, offices for judge, clerk of court, district attorney, United States commissioner, etc., and rooms for internal revenue offices. Ample water closets and fireproof vaults are provided. On the third floor will be accommodations for grand and petit jury rooms, also for witnesses, also for the signal service, which service also has conveniences on the roof for observations and display of signals. The finish throughout is to be simple in design, the woodwork being pine painted.

The amount of the appropriation for the purchase



FIRST FLOOR.



SECOND FLOOR.

A TWO THOUSAND DOLLAR COTTAGE.

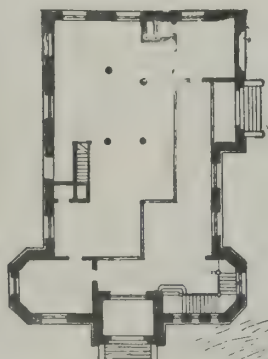
of site and erection of the building is \$90,000. It is expected to break ground about June 1, 1888, the building to progress to a finish without interruption.

Undesirable Town Houses.

There are sanitary laws respecting drainage, yet a man can build a house on a damp, retentive clay, in a

low and unhealthy situation, with impunity; there are regulations affecting traps and ventilating pipes, yet porous materials enter, and the most pernicious arrangements are allowed outside the house. Among the undesirable features of the speculative house are (1) its situation on a clay or unhealthy site that has been the rubbish bin for years; (2) its cramped and shaded position; (3) its small yard; (4) its closeness to the road; (5) its want of subsoil drainage. Crowded and shaded sites are the necessary consequences of the blindness which allows the speculator to build anywhere. One-half of the houses in London are spoilt by the other half. A nice and healthy row of villas are erected on the side of a road facing southeast, receiving the full benefit of the sun during the most desirable hours of the day; houses of great height are built opposite, entirely destroying the effect. In other cases, dwellings which receive a little of the sun are entirely cut off, leaving them in cold, unhealthy shade. The facility for destroying one another's light and air, and rendering the whole neighborhood dull and gloomy, is one of the evils of town life for which there will be no remedy till it shall be rendered impossible by law to block up or exclude the light to windows already in existence. The legislature will one day have to say how far rows of houses can be built from each other, so as to prevent impecunious builders from destroying the back premises of houses by placing another row so close as to take away all the sanitary advantages of a back area.—*Building News.*

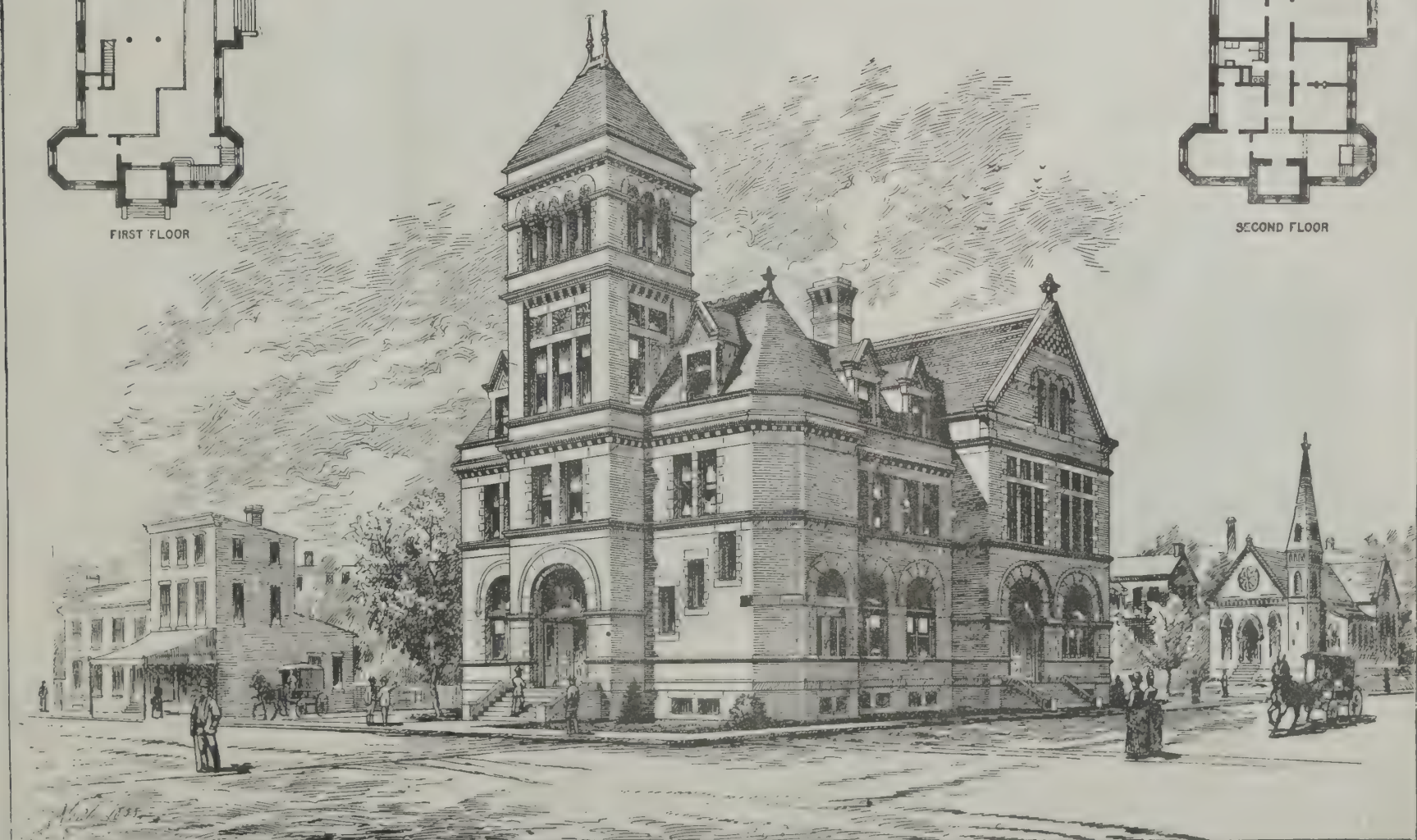
FULL plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York. Plans for the alteration and enlargement or improvement of buildings are also supplied.



FIRST FLOOR



SECOND FLOOR

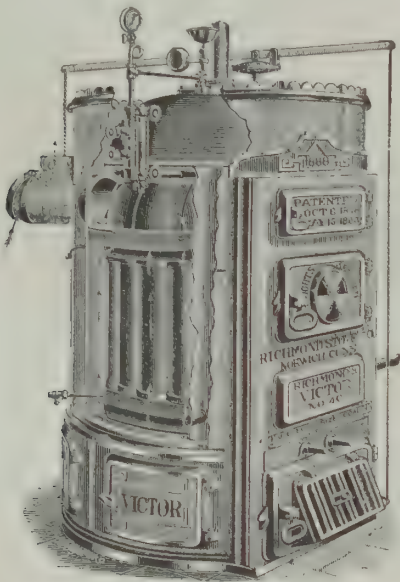


THE NEW U. S. COURT HOUSE AND POST OFFICE AT OSHKOSH, WISCONSIN.



## RICHMOND'S VICTOR STEAM HEATER.

In presenting the claims of the Richmond Victor Steam Heater to the possible purchaser, we assume that the question of the use of steam as a means of heating has been well considered and determined upon, and shall not therefore enter upon any arguments nor statement of facts to prove or disprove the particular merits of this, nor resort to comparisons with other systems of heating. The practice of heating by steam is not of recent origin, but has been in



PORTABLE FORM.

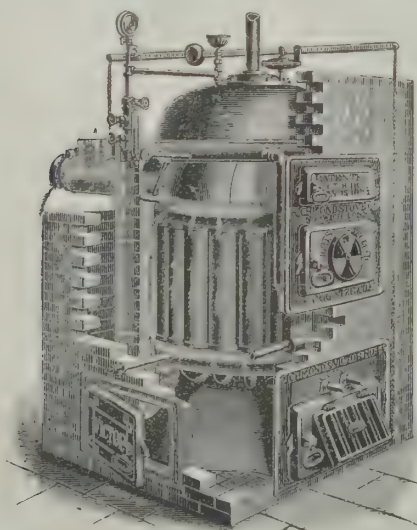
use many years, and has now become so general as to be well understood, and the means of utilizing and managing it have become so simple as to be within the comprehension of all.

We herewith present engravings of the Victor, which possesses the following five essential requisites to a perfect heater, viz.: Safety, durability, economy, simplicity, ease of management.

The Victor is a low-pressure boiler and adjusted to "blow off" at a pressure of 6 pounds to the square inch, which is far below any possibility of danger, being equipped with a safety valve of very simple construction, and certain in its action, rendering an over-pressure of steam impossible. The water gauge or glass shows at all times the height of water in the boiler, and the steam gauge will indicate the amount of pressure carried, and will aid in setting the automatic regulator in limiting it to the desired point. It is equipped with the Richmond Duplex Damper, which, in connection with the automatic regulator, is very sensitive to the slightest variations of either the fire or the pressure of steam—acting in a twofold manner, in closing the damper in the pipe and at the same time opening the cold-air check.

The Victor is constructed wholly of cast iron, and possesses all requisite strength for its legitimate uses. It is so made that no portion of the boiler is exposed to the action of the fire that is not opposed by water, and thus any unequal expansion of its parts becomes practically impossible, and all danger from damage through cracking, that would otherwise follow, is avoided. Every part of the boiler will be thoroughly tested before shipment, and every casting warranted free from defects.

By actual tests and testimonials the Victor bears the

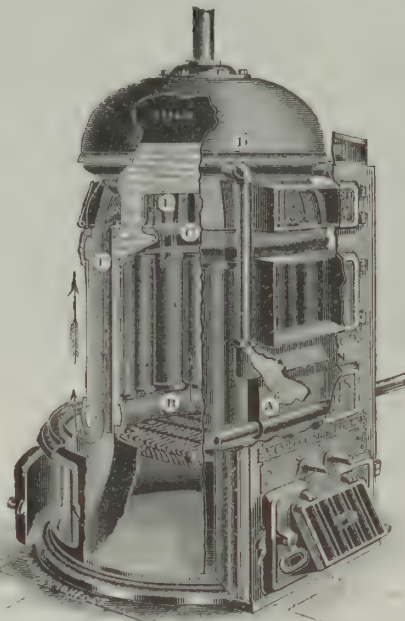


BRICK SET FORM.

palpable for a rapid generator of steam. Its own peculiar construction is such that no portion of its surface escapes the direct action of the fire upon the water, which is divided into thin sheets or columns in such a manner as to permit the steam to pass in perpendicular lines to the surface, and at the same time secures a rapid circulation of the water, which is prerequisite to the best results.

But little attention is required to maintain the proper

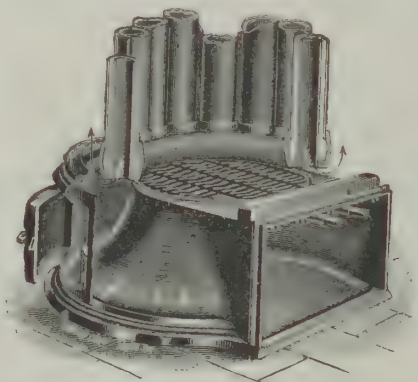
supply of water, which at all times may be determined either by the glass gauge or the gauge cocks; otherwise there remains simply the care incident to the simplest and most perfect stove or furnace, with automatic attachments for regulating the fire. The grate limits the labor of renewing the fire and removing the ashes and cinders incident to combustion to the minimum point. The flues are easily accessible, and can be



SECTIONAL VIEW.

readily cleaned, with the fire in full operation, by the ordinary user.

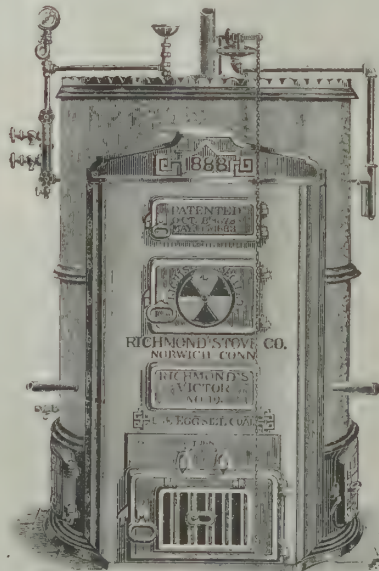
Referring to the illustration of the sectional view, A shows water front and its connections with the dome, also the pipe for the return and feed connections in its setting. This provision for supplying cold water, which, before it enters the boiler, becomes heated, is a most valuable one, as it effectually prevents what



SECTIONAL VIEW OF GRATE AND FIRE POT.

otherwise must be a sudden and unequal contraction of the sensitive parts of the heater, and in many constructions is so great as to cause serious damage. B shows the fire pot, formed by a circle of double tubes, with water occupying the space between each inner and outer space, presenting a thin sheet or column of water to the direct action of the fire.

The products of combustion passing upward, as in-



PORTABLE FORM—WITH JACKET—COMPLETE.

indicated by arrows, impinge against the crown, C, and under surface of dome, D, thence outward between tubes, E, which connect dome and fire pot section, thence down through inner tubes, F, and thence upward between inner casings or wall and outside of boiler to the exit. Thus the entire inner and outer surfaces are surrounded by the products of combustion from their generation in the fire pot to their exit in the chimney, absorbing all their effective forces before

escaping, and producing steam with a rapidity and economy which is otherwise unattainable.

We give on page 11 a series of illustrations of New England homes, in every one of which Richmond's Victor Steam Heater is used, giving in every case much satisfaction. Further information may be had by addressing the Richmond Stove Co., Norwich, Conn.

## Cheap Buildings in China.

J. D. Kennedy, consul-general at Shanghai, in a report to the Department of State upon the province of Kiang-Su, China, has the following upon "Building:"

The Chinese have a very limited supply of timber. Such as they make use of in building is from small and inferior stuff, and is sawed up by hand. They make good bricks, which form the universal building material. After the burning process reaches a certain stage the piles are flooded with water, and in this way the bricks are turned out a gray color. The roofs are usually made of tiles, and nearly every province has its own style and size of bricks and tiles. The latter are made in a very simple manner. Clay is plastered around the sides of a tub evenly and then scored off into the desired sizes. They are baked in the same way as the bricks. The houses occupied by the masses are small and flimsily constructed. This is not due to their inability to build well, but to their poverty, which may appear inconsistent with the industrious and simple habits of these people, but it is one of the many paradoxes of China.

Their bridges and temples and the walls of their cities give evidence of their skill in building and engineering, but the tendency to huddle together in villages and cities and the dread of appearing to be possessed of wealth prevent any departure from the rule of cramped, uncomfortable, and unhealthy dwellings.

Throughout this province it would be hard to find a farmer's dwelling that would be considered good enough for a pig pen with us. A wooden floor is a rarity, and with all that is said about "feng-shui," or lucky location, it would be hard to find a single house in central China where any attempt of a sanitary nature exists. No building is constructed without certain divinations which have reference to auspicious days, and are a part of the absurd series of practices which come within the term of "feng-shui." This term literally translated means wind and water, and it is claimed that originally the Chinese had a regard for sites favorably situated in respect to wind and water; which during centuries has degenerated into superstitious rites by which the fiends of the air may be thwarted. There is no doubt that the miserable dwellings of the Chinese cause the great number of diseases and suffering they endure.

With a malarial climate to begin with, and utter ignorance of the principles of the laws of health, the result could not be otherwise than a race of comparative physical inferiority. Malarial complaints are of great variety, and where the pronounced forms may not be visible there exist dull, enervating symptoms, unfitting people for any more work than will suffice to keep body and soul together, and no doubt lead to the opium habit, the curse of China.

Some of their styles of building are ingenious, and are worthy of imitation where economy of materials is the object desired. A substantial building, warm in winter and cool in summer, is made by using a large sized flat brick, laid so as to form hollow squares, into which dirt is filled. In cold climates stables or barns built in this manner would be effective against the cold and at the same time cheap.

Another kind of wall is made of gravel and straw. The former is moistened and pressed into wooden frames and allowed to harden, when the framework is removed. The Chinese possess many fine bridges of stone. One noted bridge near Soo Chow has over fifty arches. The walls of the cities exhibit an astonishing amount of what appears in these days wasted energy. The wall of Nanking is twenty-seven miles in circumference and from forty to eighty feet in height.

The fact that many of the walls surrounding the cities of China are centuries old proves the quality of their materials and workmanship.

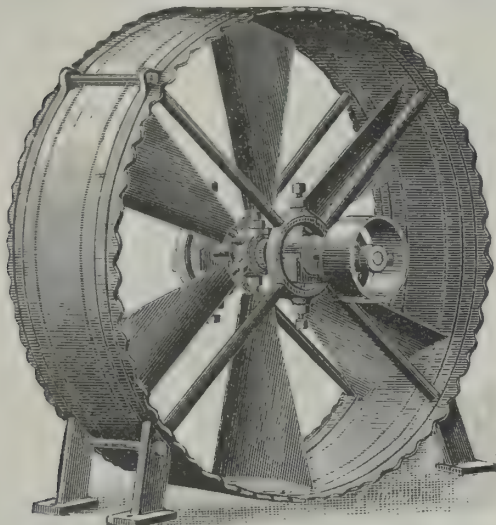
In China a coarse paper is mixed with their mortar instead of hair. This paper is soaked and worked into the mortar just as we would mix in the hair, and answers the purpose equally well.

THE public are a long time learning the advantages of dry soil and elevation. It is hard to make people understand that dry air stimulates the digestive functions, and that the higher the situation, the air becomes not only purer, but warmer. It is known to all observers that frosts are more biting in valleys than upon hills, though we are continually hearing people assert the contrary. Every gardener knows that plants thrive better on high sites than in valleys; all physicians and hygienists testify to the same effects on the health of individuals.



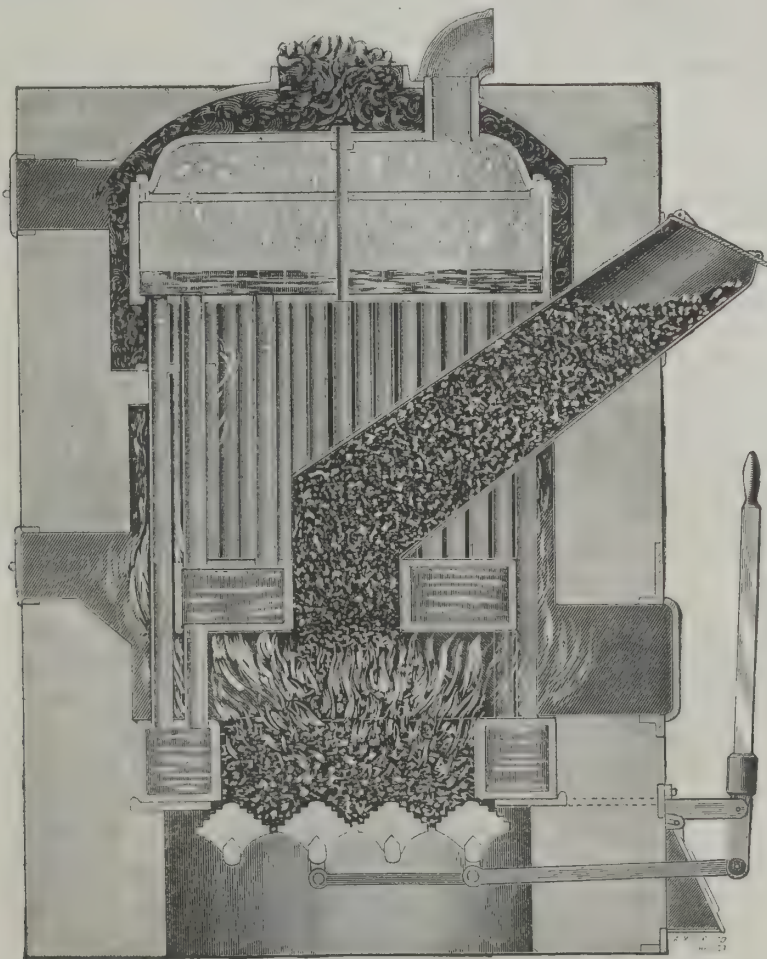
## IMPROVED FANS, VENTILATORS, ETC., FOR BUILDINGS AND FOR MECHANICAL USES.

A very noticeable feature at present in many of our large hotels and restaurants, as well as in many factories, is the extent to which fans and ventilators have been introduced, for causing air currents in rooms, and removing vitiated air or kitchen odors, or dust, smoke, gases, etc. The illustration herewith represents one of the most successful devices for work of this character—Wing's Disk Fan or Exhauster, made by the Simonds



THE WING DISK FAN OR EXHAUSTER.

Manufacturing Co., of No. 50 Cliff Street, New York. In this fan the blades are curved and have an expanding pitch, increasing the amount of air moved and reducing the slippage. The fan is inside of a framework, the blades and rim being made of cold rolled steel and the arms of the best wrought iron, so that it is very secure, though light, and can be run with very small power. The blades are adjustable, can be set to suit the conditions under which the fan is to operate, and it can be put at either end or the center of a pipe in a wall, window, or door to run either horizontally or perpendicularly, and entirely without noise. Many thousands of these fans have been sold for the general ventilation of hospitals, churches, club houses, schools, stores, houses, etc., and their use in the arts for drying has caused many important changes in mechanical processes. For use in connection therewith the company make also a small high speed engine, which is placed on the fan frame and shaft, and is practically a part of the fan; it can be run with very little care, and is very desirable in places



THE BRONSON IMPROVED MAGAZINE BASE-BURNING STEAM AND HOT-WATER HEATING BOILER.

where parties have steam but no engine, or where it is desired to run it at night without running a large engine.

The largest organ yet constructed is in the Church of St. Bavon, Haarlem, Holland; it fills up the whole of one end of the vast edifice and reaches to the roof. It has 5,000 pipes, some of them 15 inches in diameter, and 60 stops.

## Vermont Merino Sheep.

The secretary of the Vermont Merino Sheep Breeders' Association, Albert Chapman, gives an account of late shipments from his State of merino sheep to foreign ports.

The demand for Vermont merinos by the sheep raisers of Australia and the Argentine Republic has been noticed considerably by the press for the past few years. It, however, is not entirely a new thing, for satisfactory shipments were made as far back as 1854, when 20 bucks and 10 ewes were sent to Buenos Ayres, from the flock of George Campbell & Sons. If we are wrong in our statements, Mr. Chapman may be pleased to correct us. From 1864 to 1881, 92 sheep in ten different lots were shipped from Vermont to Australia and New Zealand.

The reasons that existed at that time exist now in favor of Vermont merinos for the improvement of the wool sheep of Australia and the Argentine Republic. The tendency of the sheep in the great Riverina district of Australia is to grow lighter in the fleece, notwithstanding persistent efforts to counteract it by careful selections from the stud flocks of Victoria and elsewhere. The only recourse that seemed to give the highest satisfaction was occasional importations of Vermont densely fleeced sheep. The French Rambouillet breed was at one time tried, but the results were not so gratifying as those attained from the introduction of the Vermont breed, which at once thickened the fleece and gave a dense covering underneath and on the points.—*Boston Jour. Commerce.*

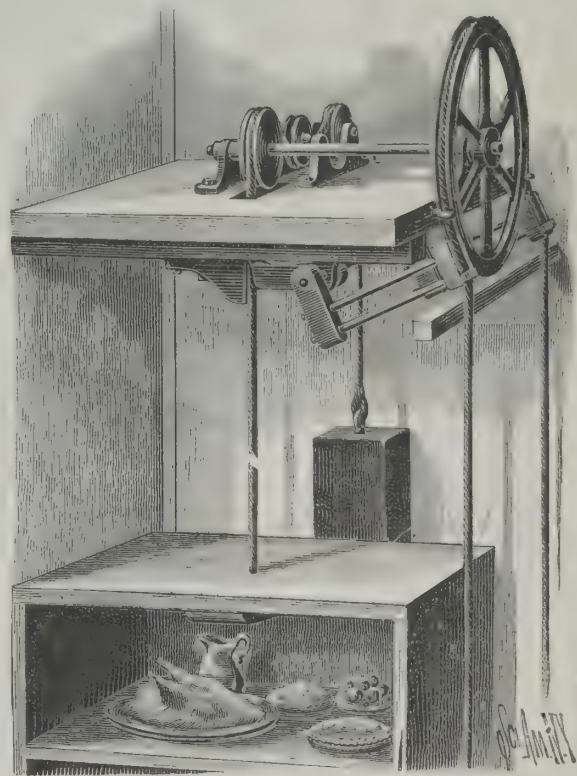
## AN ECONOMICAL STEAM AND HOT-WATER HEATING BOILER.

The accompanying illustration represents a sectional view of an economical and efficient steam and hot-water heating boiler, in which the fire surface is of the best wrought iron boiler tubing, and so adjusted that the whole boiler is as one piece of iron. Its form is similar to the upright tubular boiler, except that the portions between the base and dome are made wholly of boiler tubing; the fire surrounds the tubing, and the flame is so cut up that every part of the boiler receives its portion of the heat, thus insuring equal expansion and durability.

The magazine holds a supply of hard coal ordinarily sufficient for twenty-four hours' consumption. The grate is of a novel and decidedly improved construction, having from 60 to 70 per cent. air space, thus affording all the draught possible, and facilitating the complete combustion of the fuel, and rendering unnecessary the sifting of the ashes. The grate is rotated by the use of a lever so connected that but half of the grate section is in action at once. the lever then being

## AN IMPROVED DUMB WAITER.

A dumb waiter in which the elevator carriage with its load is securely held in place at any point in the elevator shaft, whenever the operator releases his grip on the hoisting rope, is illustrated herewith, and has been patented by Mr. Charles L. Lincoln, of No. 166 Montague Street, Brooklyn, N. Y. The rope supporting the carriage, after passing over a pulley fixed on a shaft mounted on a platform in the upper end of the elevator shaft, passes under and over smaller pulleys



LINCOLN'S DUMB WAITER.

and extends downward, carrying a weight to counterbalance the carriage. The shaft at the top has at its front end a large grooved pulley, over which runs the hoisting rope, passing through eyes at the front edge of the top platform, and over shoes secured to arms extending downward and rearward, these arms being attached to the front ends of an arm secured to a shaft held to rotate on the under side of the platform, this shaft having also fastened to it a clamping arm extending rearwardly, and with slightly curved outer edge, adapted to engage the carriage rope, and press the latter rearwardly against a fixed clamping block secured to the under side of the platform. A spring is secured to the under side of the platform in position to hold this movable clamping arm normally with its inclined edge in contact with the carriage rope, thus holding the elevator carriage from movement either way. The clamping shoes through which the hoisting rope passes are of novel construction, so that when the operator, desiring to move the carriage, pulls down on the rope, the rope comes firmly in contact with the shoe, so that the latter moves downward, whereby the arm to which the shoe is attached swings rearwardly, and the shaft on which this arm is fastened is turned, swinging the movable clamping arm to disengage it from the carriage rope. The elevator carriage is moved up or down according to the side on which the pull is made on the hoisting rope passing over the large grooved pulley, but in either case the action is the same when the operator releases his grip on the rope, the spring then forcing the movable clamping arm against the carriage rope, and clamping the latter to the fixed block on the under side of the top platform, whereby the elevator carriage is held in place at whatever point it may be until the operator has again taken a fresh hold on the rope and exerted another pull downward.

## A COMPOSITE STEEL WIRE DOOR MAT.

These mats are made of fine steel tempered wire, and thoroughly galvanized after they are made. In this way a much heavier coat of galvanizing is applied, making them very strong and rust proof. That they are economical is evident from the fact that they will not wear out. There is no cutting at cross bars, and they require no shaking, as they clean themselves. These mats are reversible, and are especially adapted



for railway and street car floors, steamboats, hotels, offices, stores, as well as residences.

Fully illustrated circular, with price list, may be had on application to the manufacturers, the Composite Iron Works Co., 83 Reade Street, New York.

connected with the remaining section, whereby the different sections are successively rotated until the fire is clean over them. This work can be readily done by a boy or a female domestic; and, all the doors of the apparatus being closed when the grates are operated, all dust is avoided, it being possible to keep a clean fire from fall until spring without the use of the ordinary poker and slice bar. These boilers are manufactured by the Weston Engine Co., of Painted Post, N. Y.



# DOMESTIC CONVENIENCES POSSIBLE WITH A HAND FORCE PUMP.

In the accompanying illustration is presented a lively view of the convenience with which domestic operations can be carried on in a country house fitted up

top sections as wanted, and that a suitable counter-shaft is provided, with floor stands, unless otherwise ordered. The table may be of either wood or iron, and collars of any diameter up to four or five inches may be run on the spindles. Eight collars are usually fur

ful to break the hard line at the edge of the mantel piece, also figures here. In larger rooms, where the recessed part by the fireplace is too long entirely to fill thus, the bookcase could either end in a series of quaint brackets from the edge to the wall, or a tall group in a gay pot or Rebecca jar could stand at the end as a finish.

## THE BOYNTON FURNACES, RANGES, AND HEATERS.

The heating appliances for private residences, schools, churches, public buildings, etc., made under the Boynton name have now been on the market for



A HOUSE WITH HAND FORCE PUMP AND TANK.

with a hand force pump in the basement, or near a cistern or other water supply, and with a tank in the upper story. Such conveniences are expected in every city house, but in houses in the country, or where water is not supplied through pipes from an elevated reservoir, they are the rare exception. The pump here shown is the "Alert," made by the Goulds Manufacturing Co., of Seneca Falls, N. Y., and is silent in action, with valves readily accessible, and easily repaired should they get out of order. The pump is very light and small, occupying a floor space of only eight by twenty inches, while it can pump against any pressure up to 100 lb. per square inch.

## NEW VARIETY MOULDER OR SHAPER.

The accompanying illustration shows a new high class upright moulder or friezer just brought out by Frank H. Clement, No. 119 Mill Street, Rochester, N. Y. It is an extra heavy, finely designed, and carefully fitted machine, especially designed to suit a critical operator who wants a good, durable, convenient tool, that can be depended upon for fine and fast work. Great pains are taken with all working parts to prevent lost motion, heating of journals, and vibration of the spindles. Among the many good points are the long bearings on the spindles, the upper one being close to the top of the spindle; self-oiling boxes covered from dust; large table surface; convenient and sure means of adjusting the spindles vertically; breadth and solidity of attachment of spindle yokes to the frame; large openings in the table around the spindle, into which rings are fitted for various sizes of collars; and many other similar features which add to the value and capacity of such a tool. The manufacturer states that the spindles can be made entire or with independent

nished with the machine. Further information may be obtained of the manufacturer, as above.

## How to Fit up a Recess.

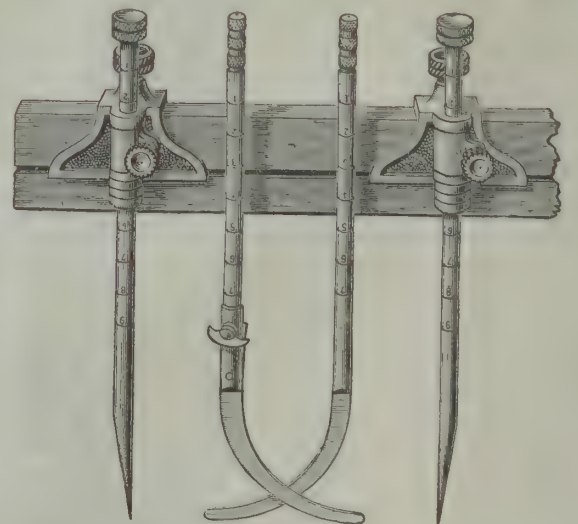
Mrs. Talbot Coke, in *London Queen*: A large proportion of my many correspondents have appealed to me for an easy, useful, and inexpensive way of filling the recesses so often to be seen, especially in a small room. Let us then suppose this room to have a pale greenish blue paper; the carpet, a rich pile, with Indian red ground and Oriental pattern; the chair has a cover of bold patterned terra cotta and white cretonne; the down cushion is of terra cotta liberty silk; and a draped chair-back of cream and gold Arabian crepe rests on the top of the chair. The recess in this instance is filled with bookshelves and nooks for china, the lower shelf being curtained with Indian red plush, and forms a useful hiding place for music, albums, magazines, etc. The shelves are here supposed to be the color of dark oak; the carved mouldings at the edge can be bought for a few pence the foot. The lining, as it were, of the little nooks should be painted Indian red—a background which shows off china pottery to the best advantage. Of course the shelves, in some rooms, would look better enameled ivory. This would be especially pretty with a yellow brocade curtain and yellow wall paper. A self-colored terra cotta fan rests against the wall, and forms a good background for one of my favorite Imari pots. Red autotypes in white and gold frames adorn the wall, the larger one draped with a quaint bit of Turkish embroidery. The chimney piece gives some idea of the effect of the lincrusta casings I so often recommend for ugly jambs, etc. The plain plush slip, trimmed with fringe, which is so use-

about forty years, and have a well established reputation for economy and efficiency. The accompanying illustration represents one of the latest improved forms of these furnaces, manufactured solely by the Boynton Furnace Co., of Nos. 207 and 209 Water Street, New York City. One of the most widely known productions of this house, which has for many years been a popular favorite, is the Baltimore heater, of which there are said to be at least 40,000 in use. Among other specialties made by the company are a "New Gas-tight Self-clearing Furnace," for use with anthracite or bituminous coal or natural gas, the "Climax," having an improved form of radiator, the "Steel Dome," with reversible flue, and the "Crusader." Their "Duplex" and "Danube" ranges, by which roasting, baking, and broiling may be carried on at the same time, free from ashes, dust, smoke, etc., are adapted alike for hotels, restaurants, and family use.

## COOK'S NEW EXTENSION BEAM TRAMMELS.

The accompanying cut represents a pair of trammel heads, with an opening through the under side to accommodate the extension, giving width and stiffness in proportion to the length required for larger work, while it is equally well adapted to receive a narrow beam for light work.

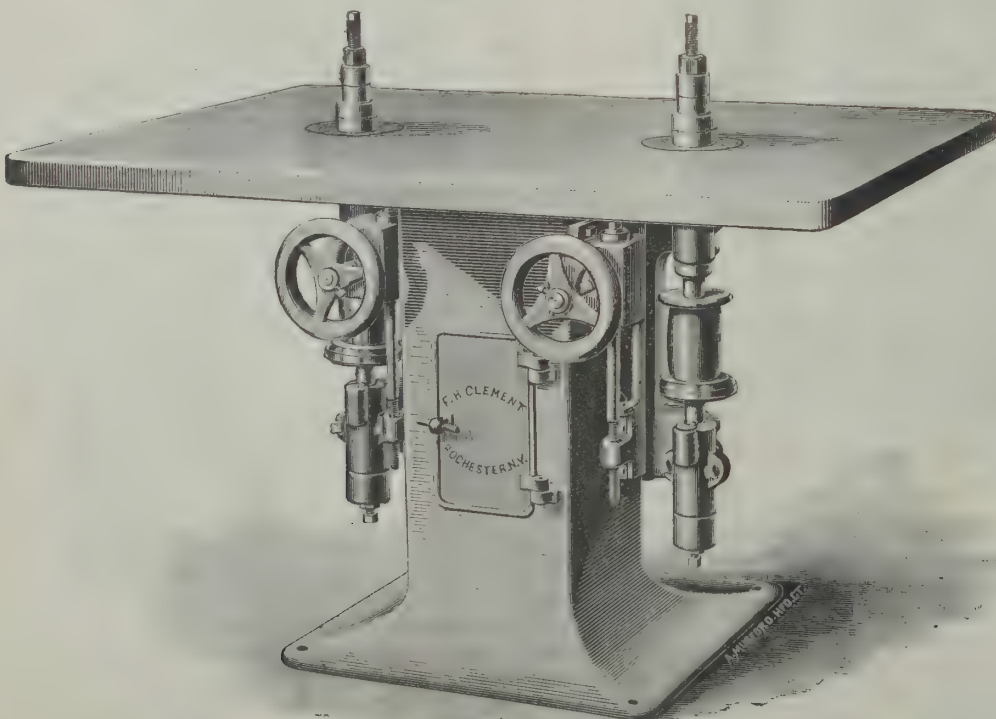
The points are eccentric, and may be loosened and rotated in their sockets to make fine adjustments. Either point may be removed and a common pencil



COOK'S NEW EXTENSION BEAM TRAMMELS.

inserted. One of the caliper legs is provided with a joint worked by an eccentric thumb piece for fine adjustments. The marks on the legs enable them to be adjusted in proper relation to each other.

L. S. Starrett, of Athol, Mass., is the sole manufacturer of this useful tool. He makes a very fine line of tools for mechanics, and has Mr. C. P. Fay, the patentee and former manufacturer of the Yankee calipers and dividers, with him as superintendent of that department of his business. His flexible steel rules have a national reputation, and he will be pleased to send his fully illustrated catalogue and price list to any who may desire it enough to forward stamp with address.



CLEMENT'S NEW VARIETY WOOD-WORKING MOULDER OR SHAPER.



## F. W. DEVOE & CO.

(Established 1852)

### PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made only of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS.**

ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.

Catalogues of our different departments to responsible parties.

Cor. Fulton and  
William Sts.,  
NEW YORK.

Coffin, Devoe & Co.,  
176 Randolph St.,  
CHICAGO.

## DEXTER BROTHERS' ENGLISH SHINGLE STAINS



Are made of the very best English Ground Colors, and contain no benzine, water, or creosote. They have been thoroughly tested by some of the best Architects in the country during the past three or four years, and the colors are more lasting than any other stain. The price is 75 cents a gallon for any color. We would advise Architects to specify Dexter Brothers' English Shingle Stain, and note the number on the Sample boards. Send for Sample Boards of Colors. DEXTER BROTHERS, 55 and 57 Broad Street, Boston, Mass.

Send for copy of Memoranda  
of Specifications.

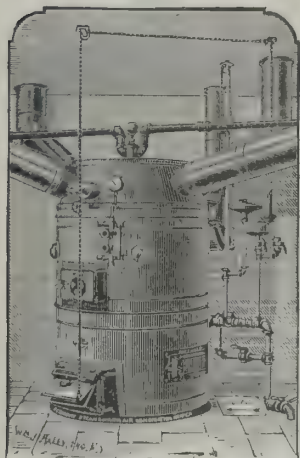
## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

MURPHY & COMPANY,  
227 BROADWAY,  
New York City.

## THE ECONOMY COMBINATION



The Combination Heater.

Steam and Warm Air Heater

—AND THE—

Economy Warm Air Furnaces

ARE PERFECTLY ADAPTED TO

Warming Churches, Schools, Residences, &c.

THEY ARE GUARANTEED DURABLE AND ECONOMICAL.

Send for our Catalogue, giving full particulars, descriptions, and illustrations of 31 different styles and sizes of Heating Apparatus.

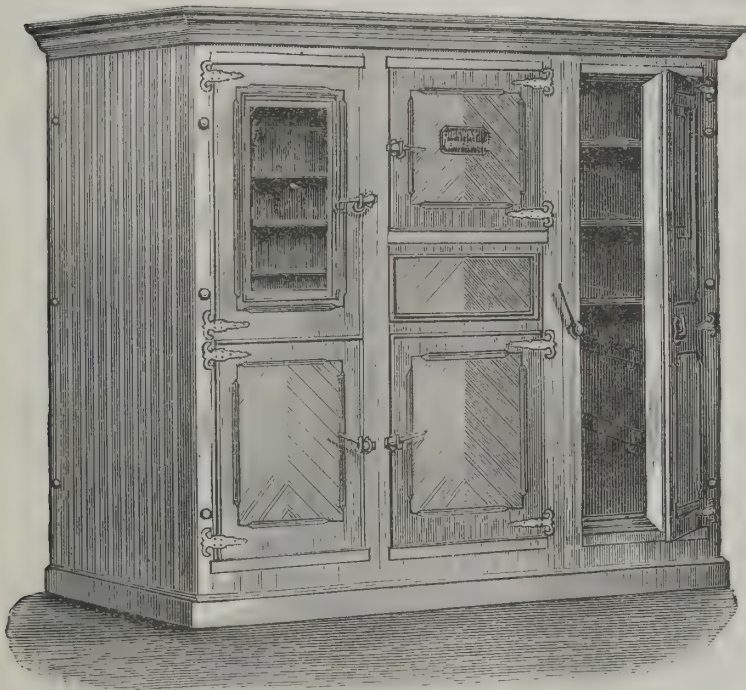
MANUFACTURED SOLELY BY THE

**J. F. PEASE FURNACE CO.**

SYRACUSE, N. Y., AND TORONTO, ONT.

Eastern Agents.—EARL B. CHACE & Co., 206 Water St., New York; JOHN DEMAREST, General New England Agent, 75 Union St., Boston; W. H. FENNER & Co., Providence.

Western Agents.—ADKINS & HOFEMAN, 177 East Randolph St., Chicago, Ill.; GOSS HEATING AND PLUMBING CO., 703 Main St., Kansas City, Mo.; ARTHUR A. POND, 35 Washington Ave. South, Minneapolis, Minn.; GAGE & HORTON MFG. CO., 1231 Olive St., St. Louis, Mo.



**RIDGWAY REFRIGERATORS**  
Built to order, of any design or size, for Residences, Hotels,  
Public Institutions, etc., etc.  
Plans and estimates furnished by  
**RIDGWAY REFRIGERATOR MFG. CO., Ltd.**  
813 & 815 Arch St., Philadelphia, Pa.

## Architects, Builders, and House Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken, leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

GENERAL OFFICES:

No. 708 PENN AVENUE, PITTSBURGH, PA.

Branch Offices:

Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
189 East Madison Street, Chicago. F. E. Dehenhardt, Manager.

MANUFACTURERS OF

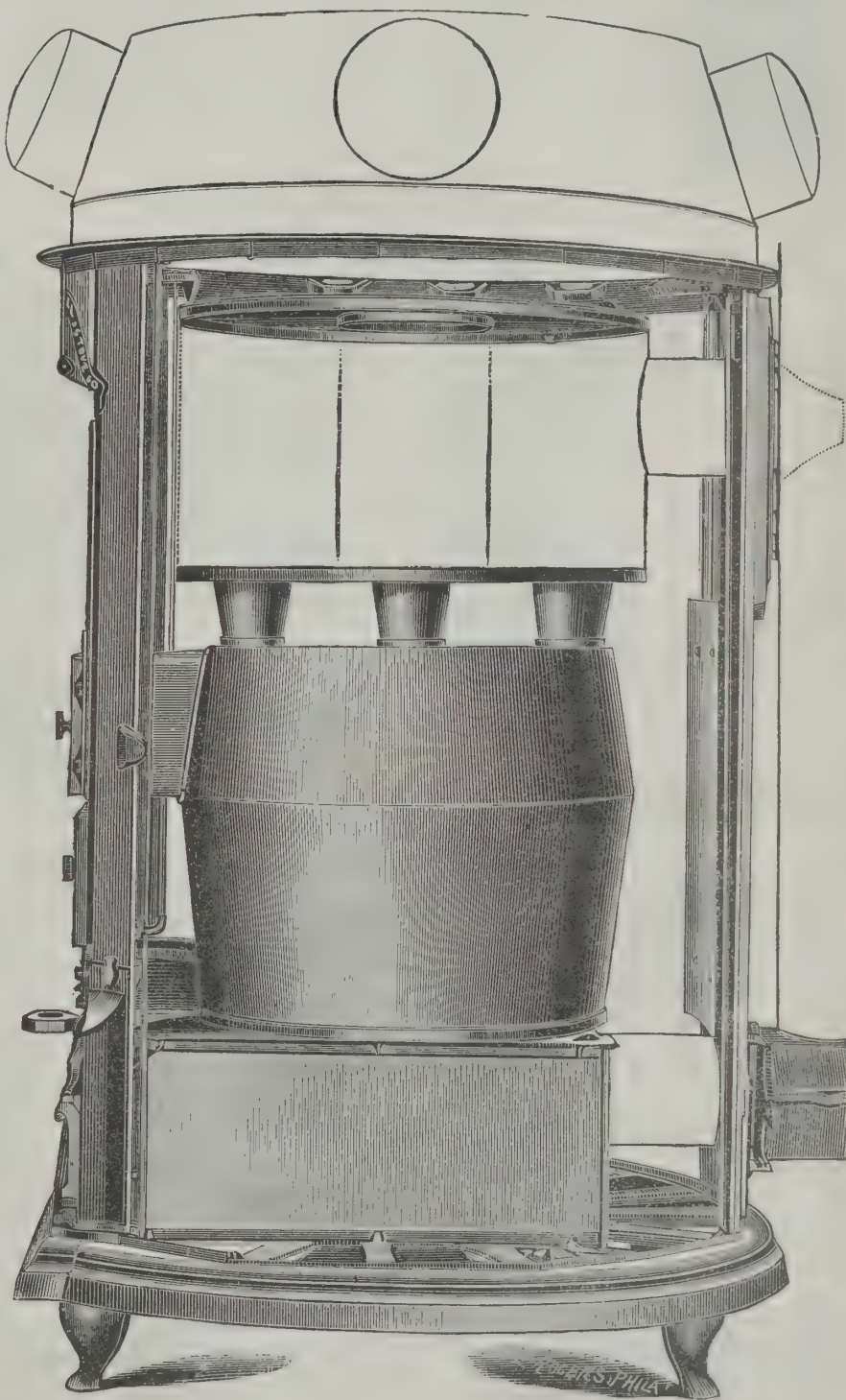
The **WARING ANTI-INDUCTION** and **BUNCHED CABLES**, and **ACHESON COMPOUND CABLE.**

For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial. **Light Leaded Cables** (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.

**Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.**

All Work Guaranteed.

Send for Illustrated Circular.



**Solar Iron Clad.**

This is a Cast Iron Casing, lined with tin or galvanized iron, to prevent direct radiation of heat in cellar; four loose panels lift out, so as to give access to furnace for repairs or renewal, if necessary, without disturbing the Hot Air Pipes; it has sliding panels for feed door and smoke pipe to allow for expansion; it has also a dust flue and flue door for Damper. We claim this to be the most complete, durable, and convenient cold case made, equal in efficiency to Brick set, with much less room required and less expensive, besides the facility for access for repairs, without requiring, as in a brick set, so large a space to work in. It is much superior to the ordinary sheet iron casing, both for durability and efficiency. It is not necessary to remove the casing or Hot Air Pipe to clean out, or repair, or even renew or change the heater.

## The Leibbrandt & McDowell Stove Co.,

PHILADELPHIA and BALTIMORE.



# MORSE ELEVATOR WORKS

MORSE, WILLIAMS & CO.  
Successors to CLEM & MORSE,  
Builders of all kinds of  
PASSENGER AND FREIGHT

Elevators,  
Automatic Hatch Doors  
A SPECIALTY.  
Send for Illustrated Circular.

Office, 411 CHERRY ST.  
Works, Frankford Av., Wilkey  
and Shackamaxon Sts.,  
PHILADELPHIA.

N.Y. Office, 108 Liberty Street.



Telephone Call,  
360 Pearl.

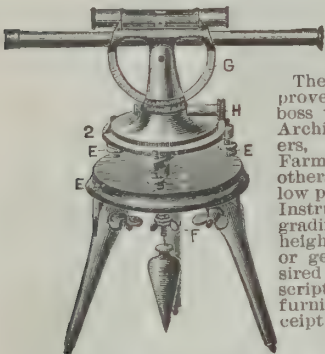
## HENRY H. HILL

36 Pearl Street,

NEW YORK,  
MANUFACTURER OF  
ELEVATORS

Factories, Stores, Warehouses,  
Stables, etc., operated by  
Steam, Hydraulic, Belt, and  
Hand Power.  
Shafting, Hangers, Pulleys,  
etc.

M. B. SWEZEY,  
MANUFACTURER OF  
Improved Dumb Waiters  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
CHICAGO, ILL.  
120 Twentieth Street,



JOHN W. HARMON,  
65 Haverhill Street, Boston, Mass.

The latest im-  
proved, i. e., the  
boss to Engineers,  
Architects, Build-  
ers, Contractors,  
Farmers, and all  
others requiring a  
low price Leveling  
Instrument for  
grading, measuring  
heights, squaring,  
or getting any de-  
sired angle. De-  
scriptive circulars  
furnished on re-  
ceipt of stamp.



## The GREAT CHURCH LIGHT

FRANK'S Patent Reflectors, for Gas  
or Oil, give the most powerful, softest,  
cheapest and best light known for  
Churches, Stores, Show Windows, Banks,  
Theatres, Depots, etc. New and elegant  
designs. Send also of room. Get cir-  
cular and estimate. A liberal discount  
to churches and the trade. Don't be de-  
ceived by cheap imitations.  
I. P. FRANK, 551 Pearl St., N. Y.

## CHARTER'S GAS ENGINE.

2 to 25 H. P.

The Simplest, most Reliable, and  
Economical Gas Engine  
in existence.

An impulse at every revolution.  
Perfect steadiness guaranteed for  
Arc or Incandescent Electric  
Lights.

Independent of gas works when  
desired, and makes its own  
gas at a cost of 65 cents per  
M. feet, or about one cent per  
hour to each indicated H. P.

A Perfectly Safe Motor  
for All Places and Purposes.

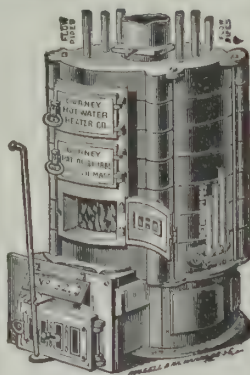
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.

Williams & Orton Mfg. Co.

P. O. Box 148. STERLING, ILL.



Mention this paper.



ELEVATION.

# GURNEY HOT-WATER HEATER

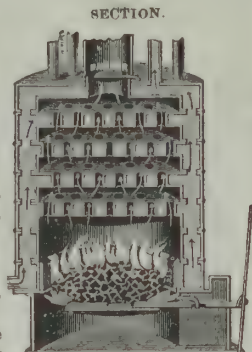
FOR WARMING

Residences, Offices, Public Buildings,  
Conservatories, etc.,

BY

HOT-WATER CIRCULATION.

Have you investigated the Gurney sys-  
tem of heating by Hot Water? If not,  
it will pay you to do so. Send for our  
Illustrated Descriptive Catalogue, free  
to all.



SECTION.

MANUFACTURED BY  
GURNEY HOT-WATER HEATER CO.

Office and Showroom, 237 Franklin Street, Boston, Mass.  
Selling Agencies.—M. H. Johnson, 140 Centre St., N. Y.; Rice & Whitacre  
Mfg. Co., 42 and 44 W. Monroe St., Chicago, Ill.; T. R. Chase, 31 Edmund Place,  
Detroit, Mich.; William Gardiner & Co., Portland, Oregon; J. L. Frisbie, 526  
Phila. St., Covington, Ky.; Valk & Murdoch, Charleston, S. C. IT PAYS TO DO WORK EARLY.

A good authority on mill construction says: "Put a  
Corrugated Iron Roof on your mill. It won't cost much, and  
you won't have to keep a man on the roof with a pail of water  
putting out the fires that are bound to start."

To which should be added: In buying, always be par-  
ticular to deal with a first class firm, one with a record of giving  
unequalled satisfaction to customers. For instance,

THE CINCINNATI CORRUGATING CO.,  
CINCINNATI, OHIO.

HENRY S. NORTHROP  
Corner Centre & Franklin St. New York, N.Y.  
**PANELED SHEET IRON CEILING**  
FIRE PROOF, ORNAMENTAL DURABLE, QUICKLY PUT UP.  
SUITABLE FOR ALL CLASSES OF BUILDINGS.  
CAP SEAM AND CRIMPED IRON ROOFINGS.



## FOOT-POWER MACHINERY.

COMPLETE OUTFITS for CONTRACTORS and BUILDERS.

Machines for ripping, cross-cutting, scroll-sawing, mortising and  
tenoning, forming edges, grooving, gaining, rabbeting, cutting  
dados, and turning. Builders use our Hand Circular Rip Saw for  
the greater portion of their ripping in preference to carting their  
lumber to a mill five minutes' drive from their shops. The same  
is true in regard to scroll sawing, mortising, tenoning, cutting stuff  
for drawers boxes, etc. Builders using these machines can bid  
lower and save more money from their contracts than by any  
other means.

Read the Following Letters from Builders:

CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your  
Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the  
ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped  
as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs  
and saved all drips for 200 windows."

ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers  
to make for a drug store; the steam power mill wanted 50 cents each for making them.  
With my foot power machinery I made them, and saved \$25 above good wages on the job.  
If desired, these machines will be sold ON TRIAL.  
The purchaser can have ample time to test them in his own shop and on the work  
he wishes them to do. Descriptive Catalogue and Price List Free.  
W. F. & JOHN BARNES CO., No. 567 Ruby St., Rockford, Ill.

CHAS. E. LITTLE, 59 FULTON ST.  
New York.

Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for

W. F. & J. Barnes' Workshop MACHINERY.

New York Agency.

Factory Prices.

## Patent Foot Power Machinery!

The Latest and Most Improved

Scroll Saws, Circular Saws,  
Lathes, Mortisers, Etc.

### THE "ACME" CIRCULAR SAW.

For Foot or Hand Power.

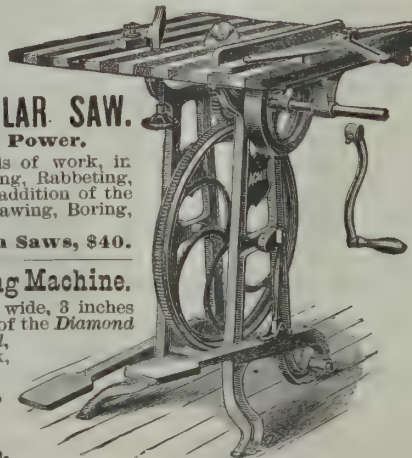
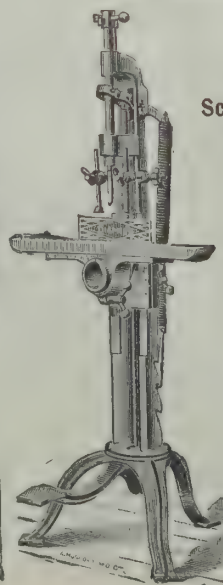
Suitable for various kinds of work, in  
Cutting-off, Ripping, Mitring, Rabbeting,  
and Grooving, and with the addition of the  
extra attachments, Scroll Sawing, Boring,  
etc.  
Price, with two 7-inch Saws, \$40.

### "Diamond" Mortising Machine.

Will mortise 1/4 to 1 inch wide, 3 inches  
deep, and with the addition of the Diamond  
Adjustable Tenoning Tool,  
cut Tenons 1/2 to 3/4 in. thick,  
3 in. wide.

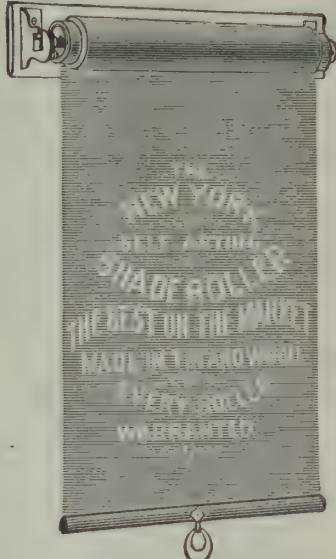
Price, with 3 chisels,  
\$25.

Machines on Trial.  
Catalogue Free.



Seneca Falls Mfg. Co.,

276 Water Street,  
SENECA FALLS, N. Y.



MANUFACTURED BY  
CUSHMAN BROS. & CO.,  
BOSTON, MASS.  
All Shades and Upholstery Goods at  
Bottom Prices.

## AUGER BITS.

Square, Oval, Round,  
Smooth Boring, for fine  
carpenter, cabinet, and  
pattern work. 1/2 in. bit  
50c.; set of five, 1 to 8-8  
in. \$4.00, free with list,  
by mail, receipt of  
price. BRIDGEPORT  
GUN IMPLEMENT  
CO., 17 Maiden Lane,  
New York.

E. & H. T. ANTHONY & CO.,  
591 Broadway, N. Y.

Manufacturers and Importers of

PHOTOGRAPHIC

INSTRUMENTS,

Apparatus and Supplies,

OF EVERY DESCRIPTION.

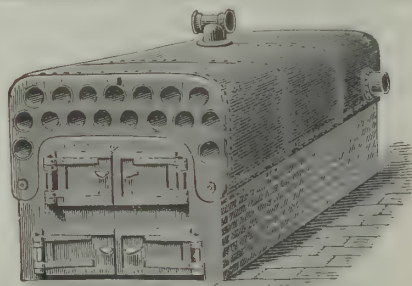
Sole Proprietors of the Patent  
Detective, Fairy, Novel, and  
Bicycle Cameras, and the Cele-  
brated Stanley Dry Plates.  
Amateur Outfits in great variety  
from \$9.00 upward. Send for  
Catalogue or call and examine.

More than Forty Years Estab-  
lished in this line of business.

ESTABLISHED 1854.  
DEVINE'S STEAM BOILER WORKS,  
Marine, Locomotive, Tubular, House, and  
**GREENHOUSE BOILERS.**

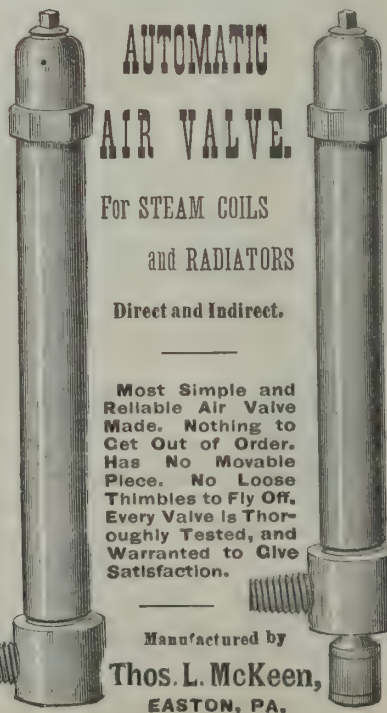
WROUGHT IRON HOT WATER BOILERS  
A SPECIALTY.

Manufactory, 381 to 393 S. Canal Street, Chicago.



The above cut is of Greenhouse Boiler, meeting  
with universal success wherever placed. Estimates  
gladly furnished for any capacity.

PETER DEVINE,  
387 S. CANAL ST., CHICAGO.



## AUTOMATIC AIR VALVE.

For STEAM COILS

and RADIATORS

Direct and Indirect.

Most Simple and  
Reliable Air Valve  
Made. Nothing to  
Get Out of Order.  
Has No Movable  
Piece. No Loose  
Thimbles to Fly Off.  
Every Valve is Thor-  
oughly Tested, and  
Warranted to Give  
Satisfaction.

Manufactured by

Thos. L. McKeen,  
EASTON, PA.



# OIL WELL SUPPLY CO., Limited.

Pittsburgh, Pa., Oil City, Pa., and Bradford, Pa.

MANUFACTURE AND SELL ALL KINDS OF

## Tools and Machinery

BOILERS, ENGINES, TUBING, CASING and ROPE

FOR

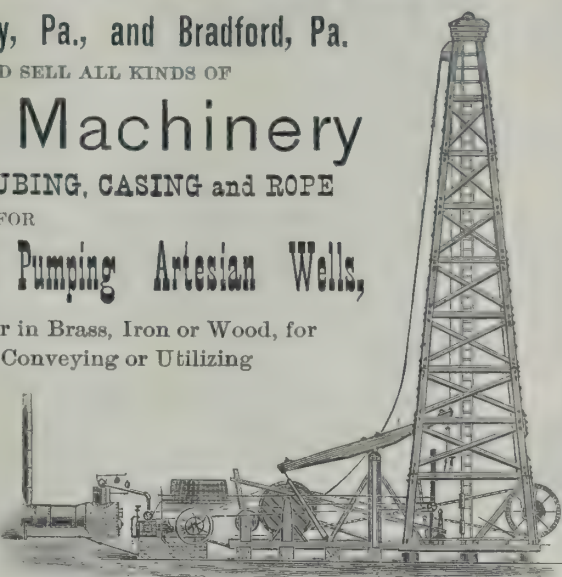
Drilling, Equipping, and Pumping Artesian Wells,

And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,

NATURAL GAS,

WATER, or STEAM.



## IMPORTANT

To Architects, Builders, House-Painters, Decorators, Boat-Builders and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Varnishes or Wood-Finishes in the market, for the following reasons, viz:

They possess more body, higher luster, greater resisting properties to atmospheric influences, action of water and alkali, are more elastic, will not scratch or mar white, and are more durable.

### WORKS:

734-740 East 14th Street,  
733-739 East 13th Street,  
199-207 Avenue D.

STANDARD VARNISH WORKS,

**D. ROSENBERG & SONS,**

Office, 207 Avenue D,

NEW YORK.

Send for Samples and Full Particulars.



For all classes

Inside Work,

Requiring great durability, use No. 2 ELASTICA FINISH.

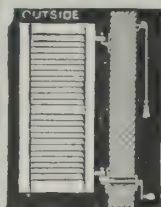
For

Outside Work,

Requiring extreme durability, use No. 1 ELASTICA FINISH.

Manufactured by

# MALLORY'S STANDARD SHUTTER WORKER



Opens and closes the blinds without raising the window.

Automatically locks the blinds in any position.

Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

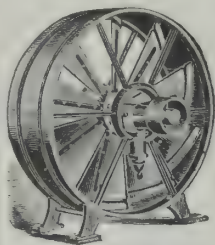
Can be applied to old or new houses, of brick, stone, or wood.

AGENTS WANTED.

Send for Illustrated Catalogue to

Frank B. Mallory,

FLEMINGTON, NEW JERSEY, or  
60 LIBERTY STREET, NEW YORK.



Clark's New Drying Exhaust and Ventilating Fans.  
PATENT ADJUSTABLE WINGS.

Capacity Quickly Increased or Diminished.

Self-Oiling Bearings.

Light Running.

Durable.

PRICE LIST FREE.

GEO. P. CLARK, (Box A), Windsor Locks, Ct.

## GLASS

PHILLIP SEMMER & COMPANY.  
PLATE, SHEET & LOOKING GLASS Depot  
No 4, 6, 8 & 10 DESBROSSES ST.  
WRITE FOR QUOTATIONS. NEW YORK.

ESTABLISHED 1844.

**SAMUEL H. FRENCH & CO.,**

York Avenue, Fourth and Callowhill Sts.,

PHILADELPHIA, PA.

## PAINT MANUFACTURERS.

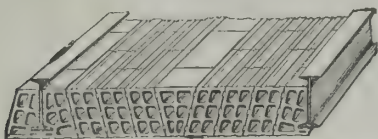
Strictly Pure Lead, Zinc and Colors, Dry, in Oil, Japan, and Ready Mixed for Use.

# PEERLESS MORTAR COLORS.

BLACK, BROWN, BUFF, AND RED.

Masons' and Builders' Supplies.

SEND FOR CATALOGUE AND CIRCULARS.



(Iron Beam Protection. Patented June 3, 1884.)

**HENRY MAURER & SON,**

MANUFACTURERS OF

**FIRE-PROOF MATERIAL**

Of every description. Hollow Brick made of Clay for Flat Arches, Partitions, Furring, etc. Porous Terra Cotta, Fire Bricks, etc., etc.

Office and Depot, 420 East 23d St., New York.

WORKS, PERTH AMBOY, N. J.



**Fine Office & Bank Fittings**

BRASS & WIRE WORK.  
A. H. ANDREWS & CO. 195 Wabash

Ave., Chicago, and 686 Broadway, N. Y.



**SECTIONAL INSULATED AIR COVERINGS**

FOR PIPES, BOILERS, DRUMS, AND ALL OTHER HOT & COLD SURFACES

SHIELDS & BROWN CO. ASBESTOS, CEMENT, PACKING, SHEATHING, ETC.

162 WORTH ST. 240 & 242 RANDOLPH ST. NEW YORK. CHICAGO.

## BEACON Stained Glass Works.

Stained, Mosaic and Embossed GLASS,

At Moderate Prices,

35 and 37 Province St.,

BOSTON, MASS.

Designs and Estimates submitted on application.



## MAXWELL'S Gypsum Paint

For Whitening and Coloring Churches, Factories, Mills, Dwellings, Barns, Fences, or for any purpose where whitewash or kalsomine is used. Made in a variety of standard colors. Put up in 1/2 and one gallon, also 1/4, 1/8, and one barrel quantities. A Beautiful, Durable, and Cheap article.

Will stand any climate. MANUFACTURED BY

**JOHN MAXWELL,**

1603 OTSEGO STREET,

PHILADELPHIA.

Mention this Paper.



## HOMES

OF

TO-DAY

Or, MODERN

EXAMPLES OF

MODERATE

COST

HOUSES

Published in one annual and three quarterly parts. Annual part now ready, 96 large quarto pages, 30 designs of buildings costing \$250 to \$12,000; nearly 200 illustrations; colored frontispiece, and full set framing plans and details of country house. A complete hand-book for those intending to build. Price, Annual Part, 50c. Each Quarterly Part, 25c. The four parts postpaid, \$1.00. F. L. SMITH, Architect, 22 School St., BOSTON.



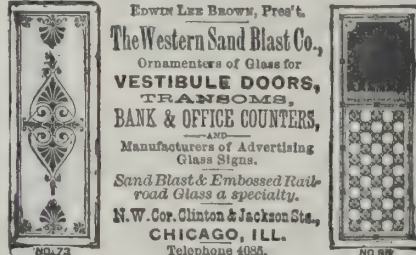
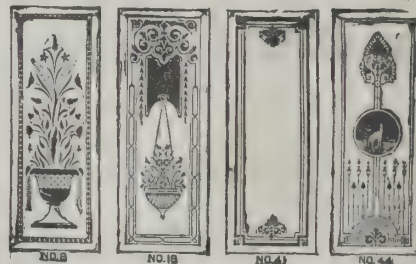
## OSY HOMES!

How to Build Them.

Contains 96 pages, showing complete designs of 10 low-cost houses, with valuable information for those who wish to build economically. The book will be mailed.

post-paid, on receipt of Price, 25 Cents. Postal note, or 1 and 2 ct. stamps.

F. L. SMITH, Architect, 22 Scho 1 St., BOSTON.



# THORN SHINGLE & ORNAMENT CO.,

SOLE MANUFACTURERS OF

The Best and Cheapest Metallic Roofing

## TILES AND SHINGLES

YET OFFERED TO THE BUILDING TRADE.

The Horseshoe Spring-Lock Shingle (Patten's Patent) just out. This Shingle can be put on in one-half the time it requires with any other shingle now in the market. Is cheap, durable, secure, thoroughly water-tight and makes a good appearance as a roof covering. Two (2) sizes.

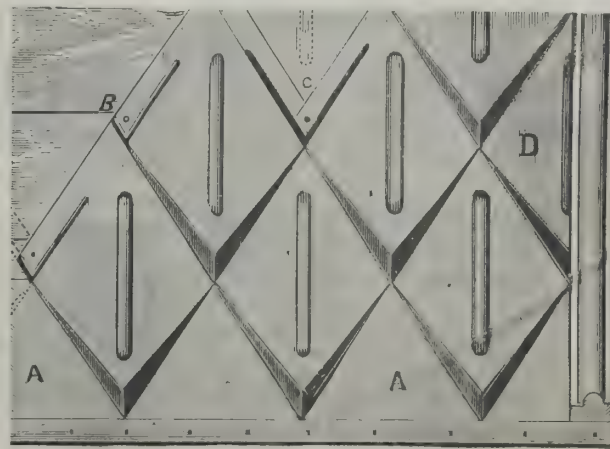
TEORN'S PATENT ROOFING and WALL TILES, the most perfect and Unique Roof, Gable, Tower, and Wall covering, yet produced in metal. On the roof in appearance they are like terra cotta earthen tiles, and are better, and half the cost. Four (4) designs or sizes are made.

All the above goods are packed a square to the box and delivered f. o. b. cars in Philadelphia.

For particulars, price lists, etc., address

**THORN SHINGLE & ORNAMENT CO.**

12th & Callowhill Streets, Philadelphia, Pa.





## The Draper Recording Thermometer.



This thermometer gives a permanent and continuous record in ink of the temperature. The chart indicating hours of the day and days of the week gives the degrees of temperature from 20° below zero to 110° above. All instruments are accurately adjusted and warranted. The record is easily read and absolutely correct. Sold by the leading instrument dealers and opticians throughout the United States and Canada, and by

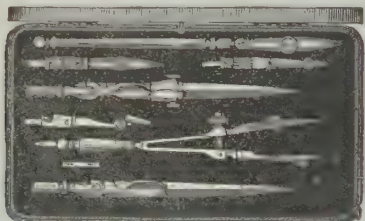
**THE DRAPER MANUFACTURING CO.**  
Owners of the United States and foreign patents, 152 Front Street, New York

**DRAWING INSTRUMENTS, DRAWING PAPER, BLUE PROCESS PAPER, AMERICAN LIQUID INK.**

A fully illustrated and priced catalogue of 200 pages of all instruments and materials used by draughtsmen sent upon mention of this paper.

**G. S. WOOLMAN,**  
116 FULTON ST.,  
NEW YORK.

**L. MANASSE,**  
IMPORTER AND MANUFACTURER,  
88 Madison Street, Chicago, Ill.



ARCHITECTS' AND SURVEYORS' SUPPLIES.

Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.

Improved LEVELS for Builders and Tiling.  
Illustrated Catalogues Sent on Application.

JOHN WHEELER,  
CARPENTER and BUILDER

—OF—  
**ORNAMENTAL RUSTIC WORK.**  
Medals from American Institute,  
And other Associations.  
P. O. Box 140. Cleveland St., Orange, N. J.



**Anderson & Dickey,**  
ARCHITECTURAL  
**WOOD TURNING**  
—AND—  
Spiral Moulding,  
43 BRISTOL ST.,  
BOSTON, MASS.

All kinds of Newels, Stair Posts, Balusters, Rails, Table and Chair Legs, etc.

Wood Mantels, Office Fittings, Interior Decorations, etc.

Rope Moulding and Twist Screen Work, etc. Architects' Designs a specialty.

Estimates given. Send 2-cent stamp for illustrated catalogue.

**THE Standard Wood Turning Co.**  
58 BAY STREET,  
Jersey City, N. J.

**MACHINE-TURNED BALUSTERS**

Various Sizes and Patterns Dove-tailed ready for use, with Tait's Patent Dovetail.

PEDESTAL and TURNED NEWELS.

STAIR RAILS,

Of all dimensions, worked, ready to put up.

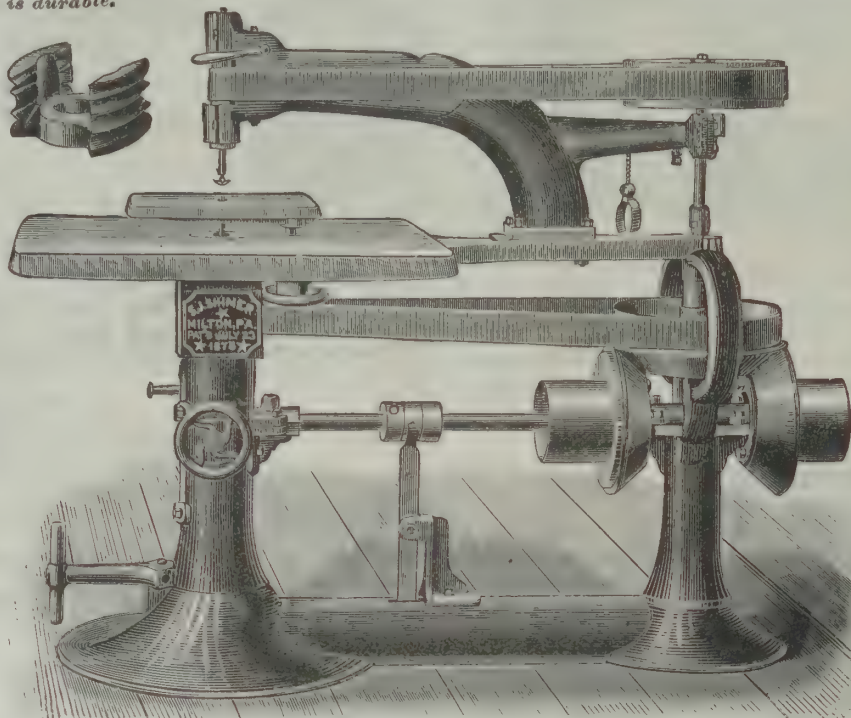
Send 4c. Stamp for our 32-page Catalogue, containing 200 Illustrations of Balusters, Pedestal Newels, Brackets, Drops, etc.

## Shimer's Variety Moulder, with Surface Moulding Attachment.

**FOR SINKING** panels with pattern guided by pin that automatically takes its position when you start the Machine, and drops out of the way when you stop it. The Cutter in the overhanging arm of the Machine has a perpendicular adjustment of one inch, and is operated by the handle shown in the cut attached to an eccentric lever that is automatically locked to the one position when at work.

**TO CHANGE** from Surface Moulder to Variety Moulder, disconnect the rod that runs the incline on the T lever and pin it up. Run the housing up by means of the hand wheel until it stands above the belt line, remove the one spindle, substitute the other and set screw it to the housing. Turn the small table back under the arm. Raise the arm, disconnect the shaft that runs the upper pulley, and the Machine becomes an Edge Moulder without having any of its parts unbolted and laid away.

You never tire of the make up of this Machine, which is as simple and effective as it is durable.

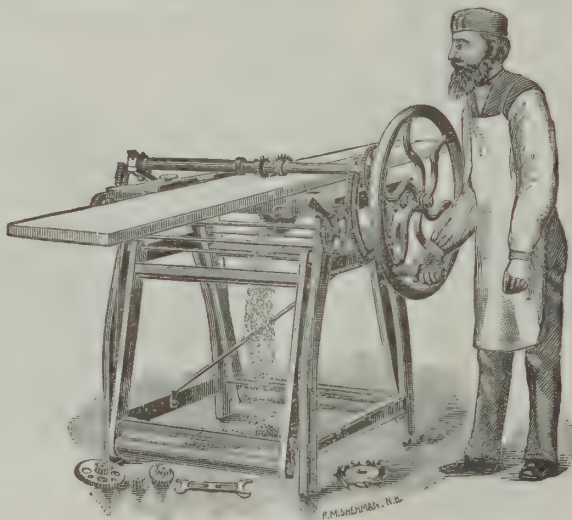


Reversible Cutters for any shape of mould made to order, and warranted to cut free and easy. For Circulars and full information, address,

**SAMUEL J. SHIMER & SONS,**  
MANUFACTURER of the SHIMER CUTTER HEADS and SPECIAL WOODWORKING MACHINERY,  
MILTON, PENN.

## CARPENTERS' MACHINERY, HAND AND FOOT POWER.

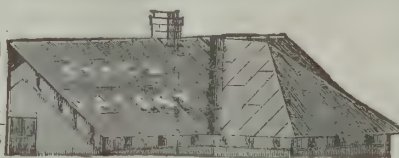
Lathes,  
Tenoners,  
Mortisers,  
Scroll Saws,  
Groovers,  
Formers.



Rip Saws,  
Cross Cut Saws,  
Combined Saws,  
Jig Saws,  
Edge Moulders,  
Dado Heads.

FRED. A. RICH, 25 South Canal Street, Chicago.

**SYKES' IMPROVED**  
Best Roof in the World.  
Suitable for all classes of Buildings. Easy put on.



All my Iron is Re-Rolled and Box Annealed, well Painted on both sides with Best of Paint and Pure Linseed Oil.

**SYKES IRON ROOFING CO., NILES, O.**

Send for Circular and Price List, and mention this Paper.

**ALLEN B. RORKE,**  
Contractor and Builder,  
423 WALNUT STREET,  
PHILADELPHIA.

ROOM 217, STEWART BUILDING, NEW YORK CITY

**C. POWELL KARR, C.E.,**  
CONSULTING ARCHITECT,

For Acoustic Work and all matters relating to Architectural Engineering.

ESTIMATES prepared from Building Plans and Specifications furnished by Architects, Owners, Builders, or Contractors for work to be done, and material supplied in the EASTERN or MIDDLE STATES. Terms upon application.

**CANTON IRON ROOFING CO., Canton, Ohio.**

MANUFACTURERS OF THE H. W. SMITH PATENT

**STEEL ROOFING.**

Made of genuine sheet steel and calaminated steel.



**CORRUGATED IRON**

Roofing and Siding, Beaded Iron Ceiling and Siding, Crimped Edge Roofing and Siding, Roof Paint, Roofer's Paper, etc.

Send for catalogue, price list, and samples.

## ARCHITECTS

SHOULD ALWAYS SPECIFY



**Mueller's WATER PRESSURE Regulators**

to insure against the bursting of pipes and to preserve a uniform pressure throughout the building. Write for illustrated catalogue and prices.

**H. MUELLER MFG. CO.,**

220 and 222 East Main St., Decatur, Ill.

## No. 11 PLANER & MATCHER

Double Beveled and Geared Lower Rolls.

Special Machinery for Car Work and the latest improved Woodworking Machinery of all kinds.

**C. B. ROGERS & CO.**  
Norwich, Conn.

109 Liberty Street,  
New York.

## TO ARCHITECTS.

THE undersigned has had much experience in the making of perspectives from plans and elevations, and will promptly execute any orders, either in ink or colors as desired.

**A. F. LEIGHT,**  
361 Broadway, New York.  
TERMS MODERATE.

ESTABLISHED 1843.

Manufacturers of

**Stable Fittings and Fixtures,**

IMPROVED and PATENTED.

IRON, BRASS, BRONZED and NICKEL-PLATED

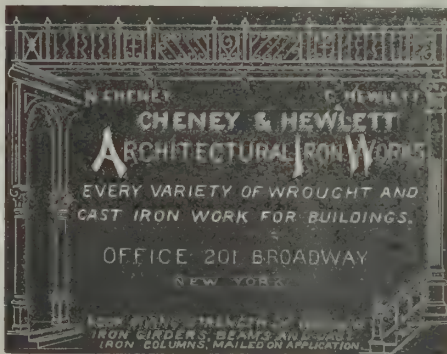
POULTRY YARD APPLIANCES, ETC.

Low estimates furnished to Architects, Builders, Carpenters, Masons, etc.

Catalogue Mailed on Application.

**SAMUEL L. BENT & SON,**

No. 111 Chambers St., New York City.



**ARCHITECTURAL AND ORNAMENTAL IRON STAIRS, GRILLES,**

GUARDS, GATES, RAILING.

Special attention to Ornamental Work.

Vault, Awn, and Skylight (Cement and Iron).

Designs, Estimates, and Catalogues on application.

**MANLY & COOPER MFG. CO.**

4150 Elm Ave., Philadelphia. 271 Broadway, N. Y.



## Instantaneous Water Heater Co.

Manufacturers of the

**DOUGLASS PATENT**

Instantaneous Water Heater,

FOR

Baths and Domestic Purposes.

Can be used any place where gas and water can be obtained.

87

Dearborn St.  
Chicago.





THE LATEST & BEST IMPROVED

# BRICK MACHINES

FOR BOTH STEAM AND HORSE POWER.



STEAM POWER BRICK MACHINE WITHOUT GEARING. WEIGHT 7000 LBS.

STEAM POWER BRICK MACHINE READY FOR PULLEY. WEIGHT 7200 LBS.



SEND FOR ILLUSTRATED CATALOGUE

## HENRY MARTIN,

INVENTOR, PROPRIETOR, AND MANUFACTURER.

139 CHESTNUT ST.

LANCASTER, PA., U.S.A.

HORSE POWER BRICK MACHINE. WEIGHT 2500 LBS.

## GIBBS' ENGLISH PORTLAND CEMENT

Is unrivalled for quality and Cheapest to use.

## INGHAM'S ENAMELED BRICKS

Are beautiful for Decoration and Interior Finish. Send for Catalogue, etc., of Novelties.

HOWARD FLEMING, 23 Liberty St., New York.



ESTABLISHED 26 YEARS

30% SAVED IN COST

WILL NOT FADE OR RUN

TRADE MARK

Send for Circular E.

## PASSENGER ELEVATORS,

MANUFACTURED BY

**HOWARD IRON WORKS,**  
BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

## GRAVES' ELEVATORS,

PASSENGER and FREIGHT,

MANUFACTURED BY

**L. S. GRAVES & SON,** Rochester, N. Y.

BRANCH OFFICE: 46 Cortlandt Street, New York.

## Cast Iron Gas and Water Pipes

1½ to 48 INCHES DIAMETER.

Cast Iron Flange Heating and Steam Pipes, Fire Hydrants and Stop Valves for Water or Gas, all Sizes.

ALL PIPE PROVED BY HYDROSTATIC PRESSURE.

**GLOUCESTER IRON WORKS,**  
GLOUCESTER CITY, N. J.

SAMUEL R. SHIPLEY, Prest.  
HENRY B. CHEW, Treas.

OFFICE,

JAMES P. MICHELLON, Secy.  
WILLIAM SEXTON, Supt.

6 North Seventh Street, Philadelphia.



## Mineral Wool

FOR  
FIRE-PROOFING,  
DEADENING SOUND,  
and INSULATION of HEAT  
and COLD in  
RESIDENCES,  
COLD STORAGE, and  
REFRIGERATING ROOMS.

Descriptive Pamphlet and  
Sample Free.

ADDRESS:

Western Mineral Wool Co.,  
Cleveland, O.

St. Louis, Mo.

## ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

To Architects,  
Builders,  
and Owners.

Attention is called to Fireproof and Vermin Proof

## MINERAL WOOL

As a Lining in Walls and Floors for preventing the  
Escape of Warmth and the Deadenng of Sound.

Sample and Circular Free.

U. S. Mineral Wool Co., 2 Cortlandt Street, N. Y.

## THE "IDEAL" PATENT TILE-LINED BATH-TUB.

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,  
BAKER BUILDING,

1524 CHESTNUT ST., PHILADELPHIA.

Send for Illustrated Circular and References.

MANUFACTURER OF

## ARTISTIC SLATE MANTELS

Grates, Fire Place Adjuncts.

Importer of TILES for all purposes.

CHAS. B. KLINE, 331 N. 4th St., Phila.

Send stamp for illustrated design sheet.

## THE HUMPHREY PONY HAND ELEVATOR.

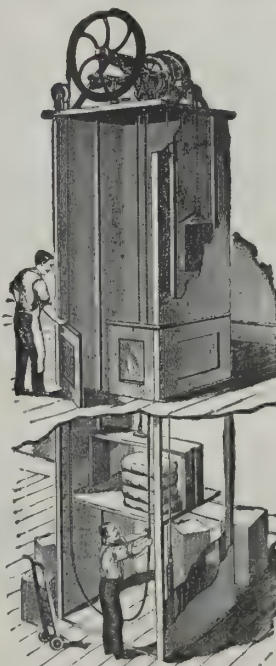
(Patent Applied for.)

For light Store and Factory work, Hospitals and Public Buildings. For Trunk and Invalid lifts. For carrying Coal, Flour, Ashes and other heavy substances in Tenements, Flats and Private Dwellings.

So simple in construction, and price so low that it can be used in many places instead of a dumb waiter, and has many times the lifting capacity. Capacity 500 pounds. Price of fixtures, \$36 per set.

We are also manufacturers of the New York Safety Dumb Waiter fixtures, the most complete, simple and absolutely safe Dumb Waiter fixtures ever made.

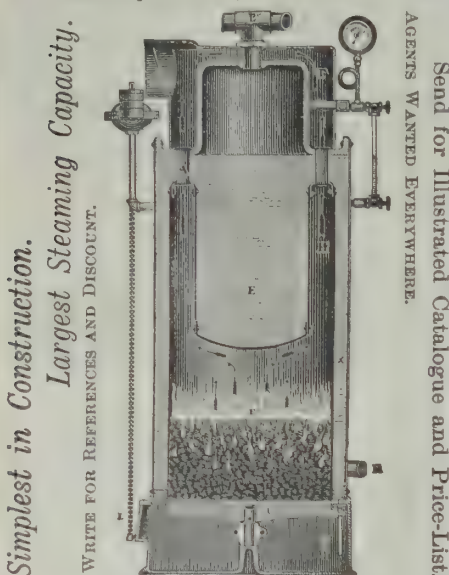
Send for Descriptive Catalogue.



THE EDWARD STORM SPRING CO., Limited,  
Poughkeepsie, N. Y.

or JOHN H. GRAHAM & CO., Sole Mfrs.' Agents,  
113 Chambers Street, New York.



**Duplex Steam-Heater Co.**Manufacturers under FISKE'S PATENTS.  
10 Barclay Street, New York.

Simplest in Construction.

Largest Steaming Capacity.

WRITE FOR REFERENCES AND DISCOUNT.

Send for Illustrated Catalogue and Price-List.  
AGENTS WANTED EVERYWHERE.**Superior Copper Weather Vanes**

GILDED WITH PURE GOLD.

TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.



Vanes made from any Drawing or Design on Short Notice.

**T. W. JONES,**

SUCCESSOR TO

**CHAS. C. BRIGGS,****V. W. BALDWIN,**

Removed from 213 Pearl Street to

**170 & 172 Front St.,**

Near Maiden Lane,

**NEW YORK.**

Illustrated catalogue of over 250 designs, mailed to any address on receipt of a two cent stamp, half the postage.

**NEW BOOKS—NOW READY****Photography Applied to Surveying.** By Henry A. Reed, U. S. Army, author of "Topographical Drawing and Sketching." With many illustrations. 4to, cloth. \$2.50."Lt. Reed's volume is the best book we know of in the English language."—*Photographic Bulletin*.**Practical Hints for Draughtsmen.** By Prof. Chas. W. MacCord, Stevens Institute of Technology. 4to, cloth. \$2.50."The book is profusely illustrated, and in every respect deserves to be strongly commended to students of mechanical drawing."—*Mechanical News*.**Stair Building.** Hand Railing by One Plane Method, applied to the drawing of all Face Moulds, and unfolding the center line of Wreaths, giving lengths of Balusters under all Wreaths. Also, Designs and Plans of the various forms of Stairs. For the use of Architects, Stair Builders, and Carpenters. By Jas. H. Monckton. 4to, cloth. \$6.00.

"I have no hesitation in pronouncing it a valuable work. Every architect, stair builder, and carpenter should procure a copy."—J. H. DICKEY, Supt. Muscatine Manufacturing Company.

**Treatise on the Diseases of the Dog.** By John Henry Steele, Royal Veterinary College, London, author of "Diseases of the Ox." With many illustrations. 8vo, cloth. \$3.50.**A Manual of Steam Boilers, their Design, Construction, and Operation.** For Technical Schools and Engineers. By Prof. R. H. Thurston. Many illustrations. 8vo, cloth. \$6.00."Probably one of the most complete works on Steam Boilers that has ever been issued."—*Manufacturers' Record*.**Notes on the Compressive Resistance of Freestone, Brick Piers, Hydraulic Cements, Mortars, and Concretes.** By Q. A. Gillmore, Ph.D., author of "Treatise on Limes, Cements, Mortars," etc. 8vo, cloth. \$3.50."The work should be in the hands of every mechanic who has to do with the construction of walls. To the Architect and Designer it is simply indispensable."—*Manufacturers' Gazette*.**Woolen and Worsted Manufacture.** Being a Practical Treatise for the use of all persons employed in the manufacture of Textile Fabrics. By Robert Beaumont, U. S. A. Upwards of 200 illustrations. 12mo, cloth. \$2.50."It is a most valuable book to the manufacturer and the operator in wool and woolsens."—*Manufacturers' Gazette*.**The Design and Construction of Masonry Dams.** Giving the method employed in determining the profile of the Quaker Bridge Dam. By E. Wegmann, Jr., C.E., Division Engineer New Croton Aqueduct. Illustrated by types showing the High Masonry Dams of the World. Containing 58 plates showing some Dams. 4to, cloth. \$5.00.**JOHN WILEY & SONS, New York,**

PUBLISHERS OF

**SCIENTIFIC and INDUSTRIAL WORKS.**

Our New Catalogue for 1888 will be sent free by mail to order.

**Notes and Queries.**

(1) S. E. M. asks: What are the wages paid to good draughtsman, and what is the best way to learn draughting? A. There is no regulated scale of wages of a draughtsman. A boy can drive a rule and pen, but it takes brains to make a good draughtsman. This commodity may be worth from \$500 to \$5,000 per annum. If you have ideas and have the energy, you will succeed accordingly. To start, get the series of SCIENTIFIC AMERICAN SUPPLEMENT, on mechanical drawing (\$2.50), with the instruments there listed, and get to work. After you have assured yourself that you can handle the pencil and pen, offer your services as assistant in some engineering establishment.

(2) F. T. H. asks: 1. What vehicle should powdered soapstone be mixed with, when brick outside walls are to be painted? A. Boil with linseed oil and a small quantity of resin. 2. What to mix it with when iron work is to be painted? A. Linseed oil. 3. Also please explain why, when a  $\frac{1}{4}$  inch glass tube is introduced into water, the water level in the tube is always about an eighth of an inch above the normal level? A. On account of capillarity, for a description of which see Sir William Thomson's lecture in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 562, 563, which we can send you for ten cents each. 4. In running electric wires through gas mains, is there any insulation in the market that will effectually resist the chemicals usually found in gas mains? A. A wire insulated and coated with lead over the insulation would be most effectual. Most other styles would quickly or slowly deteriorate.

(3) W. S. asks (1) how breaking strain on suspension bridge cables is computed. A. The strains are generally computed on the assumption that the curve is a parabola. 2. What cheap and effective way to destroy or drive small red or brown ants from and around the house? A. Try a good insect powder. 3. What is your charge for assaying ores for gold and silver, etc., also for analysis of ores? A. From five dollars upward.

(4) H. & W. ask: 1. What is the best walnut stain? A. Take of spirits of turpentine 1 gallon, pulverized asphaltum 2 pounds, dissolve in an iron kettle on a stove, stirring constantly. Can be used over a red stain to imitate rosewood. The addition of a little varnish with the turpentine improves it. 2. What is the best preparation, and how made, for putting on the strings used in sealing fruit jars, etc.? A. Dissolve one pound of sulphate of zinc in 40 gallons of water, and then add 1 pound of sal soda. After these ingredients are dissolved, add 2 ounces tartaric acid. The cord should be soaked in this solution for twenty-four hours and then dried without wringing.

(5) C. H. F. asks the English and also the American standard of pipe taps, the pitch of thread taper, and size of point of tap? A.  $\frac{1}{8}$  inch pipe 27 threads to 1 inch,  $\frac{1}{4}$  inch and  $\frac{3}{8}$  inch pipe 18 threads to 1 inch,  $\frac{1}{2}$  inch and  $\frac{3}{4}$  inch pipe 14 threads to 1 inch, 1 inch,  $1\frac{1}{4}$  inch,  $1\frac{1}{2}$  inch and 2 inch  $11\frac{1}{2}$  threads to 1 inch,  $2\frac{1}{2}$  inch up 8 threads to 1 inch. All threads taper  $\frac{1}{8}$  inch to 1 foot on each side. End of taps should be one-sixteenth inch smaller than diameter of bottom of thread at end of pipe, using pipe thread as a gauge.

(6) E. M. P. asks how he could make a good stain for brick that would be permanent and not wash off with the rain. A. Dissolve 1 ounce of glue in a gallon of water, and when hot put in a piece of alum the size of an egg,  $\frac{1}{4}$  pound Venetian red, and 1 pound Spanish brown. Try a little on the bricks; if too light, add more red and brown; if too dark, put in more water.

(7) J. P. H. H. desires a receipt for removing discolorations from granite caused by over-hanging trees, something that will restore it to original color, without damaging the stone. A. Try a weak solution of hydrochloric acid or a solution of caustic potash.

(8) E. H. D. desires (1) recipes for making purple, green, and black type writer copying inks. A. Use any desired aniline color. Dissolve in 15 parts alcohol, and add 15 parts glycerine. 2. What photographic preparation is most sensitive to artificial light, and how is it compounded? A. Gelatino-bromide of silver is the most sensitive. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 541.

**THE TIFFANY GLASS COMPANY**

MEMORIAL WINDOWS

GLASS WORK DECORATIONS

Designs and Estimates submitted.

333-335 Fourth Ave., New York City.

**J. B. LIPPINCOTT COMPANY'S**

NEW SUMMER BOOKS.—Just Issued.

**ANIMAL LIFE OF THE SEA SHORE.**

By ANGELO HEILPRIN, Professor of Invertebrate Paleontology at the Academy of Natural Sciences of Philadelphia, author of "The Geological Evidence of Evolution," "Town Geology," etc. Fully illustrated. 12mo, Cloth, \$1.25; Paper, 50c. A popular treatise, interesting to sojourners by the sea.

**LACONISMS ON ALL SORTS OF SUBJECTS;**

Or, The Wisdom of Many in the Words of One. By J. M. P. OTTS, D.D. 12mo, Extra Cloth, 75c.

**FROM EIGHTEEN TO TWENTY.**

A new novel. By a prominent society lady of Philadelphia. 12mo, Extra Cloth, \$1.00.

**AMERICAN NOVELS.****BRUETON'S BAYOU AND MISS DEFARGE.**

No. 2. By JOHN HABBERTON, author of "Helen's Babies," and FRANCES HODGSON BURNETT, author of "That Lass o' Lowries." Complete in one vol. Square 12mo, Extra Cloth, \$1.00; Paper, 50 cents.

**THE DESERTER AND FROM THE HANKS.**

No. 1. By CAPT. CHARLES KING, author of "The Colonel's Daughter," "Marion's Faith," etc. Sq. 12mo, Extra Cloth, \$1.00; Paper, 50 cents.

**LIPPINCOTT'S SERIES OF SELECT NOVELS.****DAPHNE.**

No. 86. A novel. By "RITA," author of "Vivienne," "Like Dian's Kiss," etc. Half Cloth, 50 cents; Paper, 25 cents.

**TOO CURIOUS.**

No. 85. By EDWARD J. GOODMAN. 16mo, Half Cloth, 50 cents; Paper, 25 cents.

**A LIFE'S MISTAKE.**

No. 84. By MRS. H. LOVETT CAMERON, author of "In a Grass Country," "Pure Gold," "Vera Nevill," "Worth Winning," etc. Half Cloth, 50 cents; Paper Cover, 25 cents.

**MRS. WISTER'S NEW NOVEL.****PICKED UP IN THE STREETS.**

A romance from the German of H. Schobert. 12mo, Extra Cloth, \$1.25.

\*.\* If not obtainable at your Booksellers', send direct to the Publishers, who will forward the books, free of postage, on receipt of the price.

**J. B. LIPPINCOTT COMPANY**

PUBLISHERS, BOOKSELLERS, AND STATIONERS,

715 and 717 Market St., Philadelphia.

**TRINITY CHURCH, BOSTON,**

MASS. MONOGRAPHS OF AMERICAN ARCHITECTURE. No. V. A Portfolio giving 22 Gelatine Views and 1 Heliochrome, 13 x 16 inches. \$10.00.

"They represent the church both inside and out, from every point of view interesting, either picturesquely, artistically, or historically. They begin with the very striking portrait of Richardson by G. C. Cox, representing him in a great dark hood, like some churchman of the middle ages, 'well robed o'er all his form.' Fra Lippo Lippi it might be, with the penetrating beauty of the great, brilliant eyes beneath the grand sweep of the brows. The head alone is worth the price of the monograph. The heliochrome of the apse and tower from the east, with the soft green of the ivy, on which, when not shaded by the tower, the sun shines warm, contrasted with the terra-cotta and slate of the roof, and the fine mingling of the light Deeham granite with the red of the Longmeadow freestone, is singularly beautiful. Following this are another general view from the northwest, the main entrance, detail of the west front, the tower from the south, with two other views of the tower in detail, the cloister and chapel from the southeast, and a view of the cloister showing the tracery window from St. Botolph's, England; the cloister garth, the stairway to the chapel, the entrance to the north transept, the chancel, the north side of the nave, the font, the bust of Arthur Penrhyn Stanley, the nave from the gallery of the south transept, the interior of the tower, and last, before the plan, the characteristic cartoon for the stained glass window by Burne-Jones. The church is here in all its aspects. And by the publication of this monograph the literature of American architecture has been very splendidly, beautifully enriched."—*Boston Advertiser*.

LOOKING BACKWARD, the latest novel by Edward Bellamy, presents a marvellously beautiful and pacifying picture of American life, A.D. 2000, in a vast, happy, competitionless, crimeless, paternal, serene Republic, where individualism and monopoly, and the dread struggle for existence find no place. *The Boston Advertiser* calls it: "Immensely interesting and immensely suggestive." \$1.50.

QUEEN MONEY, the brilliant new novel, by the author of "The Story of Margaret Kent," has already passed into its fifth large edition. It is a wonderful story of New York society. \$1.50.

DR. PEABODY'S HARVARD REMINISCENCES, that delightful volume of anecdotes and incidents of the famous men of the University (like Felton and Paifrey and Sparks), with its high-bred manner and genial humor, is very popular among men of cultivation, old or young. \$1.25.

UNDER THE SOUTHERN CROSS is Mr. Ballou's new book of travels in Australia, New Zealand, etc. This record of the author's travels last year is written with delightful bonhomie, and makes a fascinating companion for Fireside Travels. The same writer's recent book of Scandinavian and Russian travel, *Due North*, is a vivid account of the cities and peoples between the North Sea and the Volga.

Sent post-paid on receipt of price, by

**TICKNOR & CO., Boston.****SEBASTIAN, MAY & CO.,**

Manufacturers of and Dealers in

**Hard and Foot Power Machinery**

For CARPENTERS, BUILDERS, MACHINISTS, etc.

Write for our New Catalogue, just issued.

**183 W. Second St., Cincinnati, O.****New Combination Dividers.**

Forming Dividers with short and long extension points (pencil may be used in connection with either), Outside Calipers, Inside Calipers and Hermaphrodite Calipers.

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard tough, strong, and finely finished.

The joint is large and firm. The quadrant is round and fastened by an improved method. The steel points are tempered by a process which leaves them hard and tough. On the threaded end of the quadrant, between the adjustable legs, is a knurled nut, against the inside of which a helical spring acts. After the points are adjusted the nut may be turned back against the leg, LOCKING IT FIRMLY.

A common pencil fits either socketed leg, while an auxiliary holder is also furnished to fit reversed end of either point. This is one of the most useful combinations of the kind, as well as the BEST MADE tool ever produced.

Send Stamp for Illustrated Price List of Fine Tools for Mechanics.

**L. S. STARRETT,**

MANUFACTURER OF

Combination Squares, Caliper Squares, Bevel Protractors, Thread Gauges, Steel Rules, Surface Gauges, Scratch Gauges, &amp;c., &amp;c.

Full Line of Callipers and Dividers, best on the market.

**ATHOL, MASS.****The Old Bangor Slate Company**F. C. YARNALL, President,  
PHILADELPHIA.J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawed Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.



*J. Rayner.*  
IMPORTER AND MANUFACTURER  
**MAHOGANY**  
CABINET WOODS AND VENEERS.  
FOOT EAST HOUSTON ST NEW YORK. | FULTON & MORGAN STS CHICAGO ILL.

**Warren's Natural Asphalt Roofing.**  
Superior to all others for Flat Roofing.  
Over 20,000,000 square feet used within 10 years.  
This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.  
**"COMPOSITE" FELT.**  
For Roof Foundations.  
A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is absolutely impervious to moisture; for use under slate, shingles, etc., it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete water-proof covering.  
Send for samples and Circular No. 2.  
**WARREN CHEMICAL & MFG. CO., No. 114 John Street, New York.**

**E. J. JOHNSON,**  
**ROOFING SLATE**  
MARBLEIZED SLATE MANTELS, SLATE HEARTHS, SILLS, LINTELS, ETC.  
SLATE NAILS, ROOFING FELT, SLATERS' CEMENT, ETC.  
ESTIMATES FURNISHED ON ALL SLATE WORK.  
**QUARRY, BANCOR, PA. OFFICE, 18 BURLING SLIP, N. Y.**

*Franklin P. Carter Chas. M. Wilkins E. Ward Wilkins*  
ESTABLISHED 1867.  
**PARTRICK & CARTER.**  
MANUFACTURERS OF AND DEALERS IN EVERY DESCRIPTION OF  
**ELECTRICAL SUPPLIES**  
SOLE PROPRIETORS OF THE  
PATENT NEEDLE ANNUNCIATORS AND BURGLAR ALARMS  
WE MAKE A SPECIALTY OF  
BELLS, DISQUE LECLANCHE BATTERIES, GAS-LIGHTING APPARATUS  
AND A FULL LINE OF  
**SUPPLIES FOR ELECTRIC BELL WORK**  
WE PUBLISH CATALOGUES OF ALL OUR MANUFACTURES AND WILL FORWARD TO ANY ADDRESS UPON APPLICATION.  
WHEN APPLYING FOR CATALOGUES PLEASE STATE WHETHER ELECTRIC BELL OR GENERAL ELECTRICAL SUPPLY CATALOGUE IS WANTED, AND IF IN THE TRADE INCLUDE BUSINESS CARD FOR DISCOUNTS.  
**114 SOUTH SECOND STREET. PHILADELPHIA, PA.**

**ADAMANT**  
**WALL PLASTER.**  
MANUFACTURED BY  
**Adamant**  
**Manufacturing**  
**Company.**  
OFFICE  
63 EAST GENESEE STREET,  
SYRACUSE, N. Y.

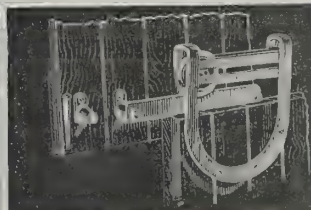
**The New, Cheap, and Only Superior**  
**Substitute for Common Plaster.**  
It is hard as marble, and will last as long as the building.  
It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.  
It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.  
It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.  
It does not crack or fall off, even in case of leakages.  
It is applied easily by any good mason.  
It is the only material with which repairing can be done neatly and "to stay."  
For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,  
For Pennsylvania, **KEYSTONE PLASTER CO., 233 No. 23d St., Philadelphia,**  
or, " " " " **Williamsport, Pa.**  
For Massachusetts and Rhode Island, **BAY STATE ADAMANT CO., 164 Devonshire St., Boston, Mass.**  
For Connecticut, **CONNECTICUT ADAMANT CO., 480 Grand Avenue, New Haven, Conn.**  
For New Jersey, **NEW JERSEY ADAMANT CO., 61 Passaic Avenue, Harrison, N. J.**

**THE PRENTICE METALLIC HIP SHINGLE**  
Patented Sept. 21, 1886.  
Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow-tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application. Price \$3.00 per hundred. Small lots sent by express C. O. D. When ordering give pitch of roof. Liberal discounts to dealers and agents. Send for circulars. Address  
**Metallic Hip Shingle Co., Toledo, O.**  
Sole Manufacturers. Look Box 184.  
Orders promptly filled.  
Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.  
**J. DUNFEE & CO.,**  
**Wood Carpet and Weather Strips**  
OF ALL KINDS,  
102 Washington Street, - - CHICAGO.  
SEND FOR CATALOGUE.  
Factory, 204 to 212 South Clinton Street.

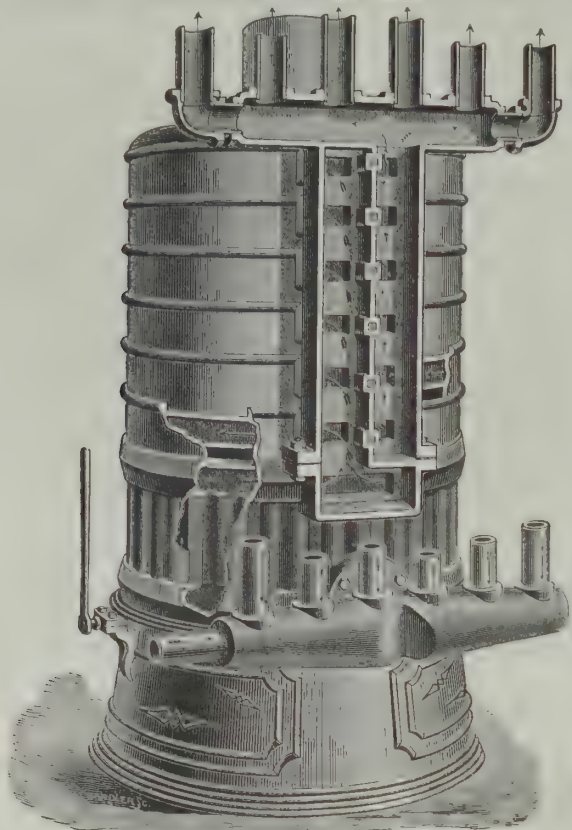
**Security Sash Lock.**  
PATENTED  
Nov. 9, '86.  
ANTI-RATTLER.  
  
THE  
**CLAFLEN**  
MFG. CO.  
Cleveland, O.  
U. S. A.  
Sole Manufacturers.  
The New Catalogue of Valuable Papers  
contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.  
MUNN & CO., 361 Broadway, N. Y.

**PITTSBURGH PLATE GLASS CO.,**  
**CREIGHTON, PA.,**  
MANUFACTURERS  
**POLISHED PLATE GLASS.**  
Ground and Rough Plate Glass for Floors and Skylights.  
Three-sixteenths thickness, made expressly for fine residences.  
**LARGE AND WIDE GLASS A SPECIALTY.**  
The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.  
**IMMENSE PRODUCTION.**

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.  
The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.  
—CORRESPONDENCE SOLICITED.—  
**Works No. 1, CREIGHTON, PA.**  
**Works No. 2, TARENTUM, PA.**  
WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL OFFICE, CREIGHTON, PA.

**LANE'S PATENT STEEL DOOR HANGER**  
The most perfect Anti-Friction Hanger in the Market.  
  
**BECAUSE**  
It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.  
**LANE'S PATENT TRACK**  
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.  
Manufactured by **LANE BROS., Poughkeepsie, N. Y.**  
**JOHN H. GRAHAM & CO., General Agents, 113 Chambers St., N. Y.**  
SOLD BY HARDWARE DEALERS GENERALLY.





View showing course of water in Spence (No. 5) Hot Water Heater.

Send for Pamphlet, "Heating by Hot Water Circulation."

NATIONAL HOT WATER HEATER CO.,  
191 Fort Hill Square, Boston.



"PERFECT"  
TRADE MARK  
Hot Water  
Heater.



Hot Water, as a medium for heating Private and Public Buildings, is largely engrossing the attention of the public, as being more satisfactory and certain in its operation, and more easily managed than Steam. Having constructed a Hot-Water Heater that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

Richardson & Boynton Co., Mrs.,  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.

ESTABLISHED 1836.

BARSTOW STOVE COMPANY,  
—MANUFACTURERS OF—

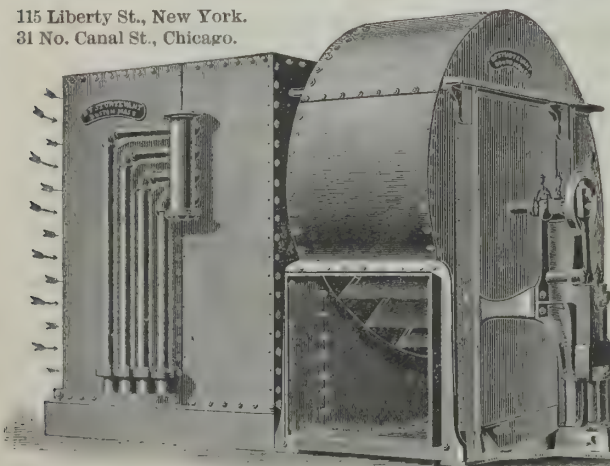
Cast Iron and Steel Plate Furnaces,  
Portable and Brick Set Ranges, Parlor  
Stoves, and Baltimore Heaters.

SEND FOR ILLUSTRATED CATALOGUE.

BARSTOW STOVE CO.,

230 Water Street, NEW YORK; 56 Union Street, BOSTON;  
PROVIDENCE, R. I.

115 Liberty St., New York.  
31 No. Canal St., Chicago.



THE STURTEVANT  
Steam Hot Blast Apparatus  
FOR  
HEATING and  
VENTILATING  
BUILDINGS  
OF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.

Send for Illustrated Treatise on  
Ventilation and Heating.  
B. F. STURTEVANT,  
BOSTON, MASS.

BRANCHES:  
New York. Chicago.

## THE BOYNTON FURNACE CO.

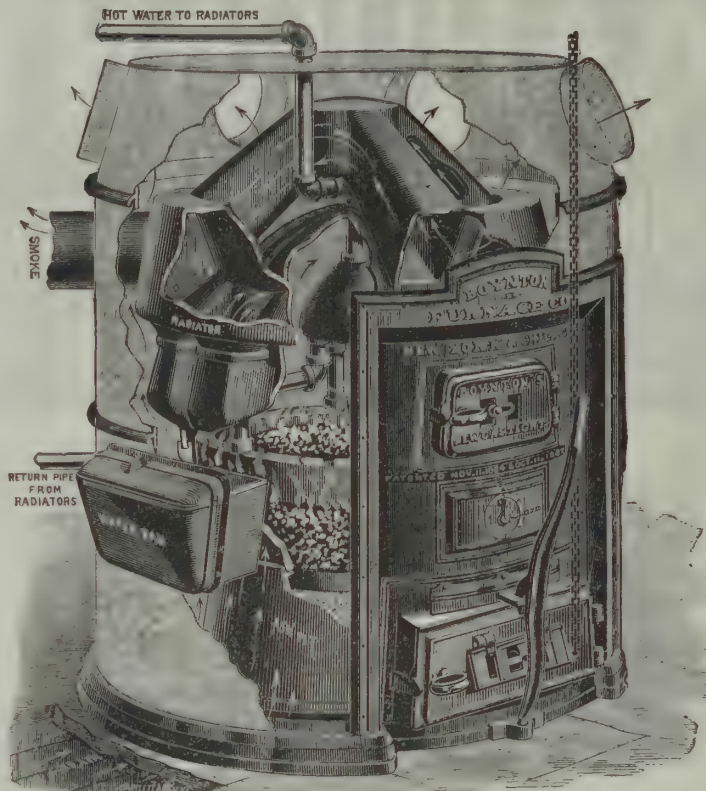
207 & 209 WATER STREET, NEW YORK;  
47 & 49 DEARBORN STREET, CHICAGO, ILL.,

—SOLE MANUFACTURERS OF—

Boynton's "New Gas Tight" Self-Clearing Hot Air  
Furnace with Hot Water Combination.

Patented October 11th, 1887.

THOROUGHLY TESTED, AND NO EXPERIMENT!



Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The HOT WATER HEATER is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

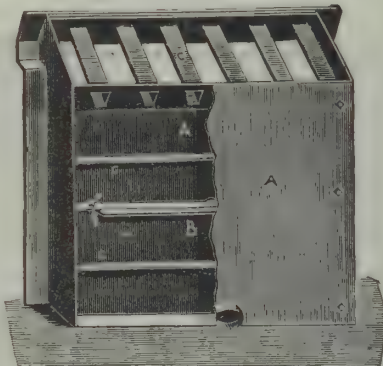
It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or all Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.

## The OMEGA FIREPLACE FURNACE



2) page illustrated catalogue,  
containing full information and  
prices, sent to any address.



A Double Heater and Perfect Ventilator. A Revolution in Fireplace Heating. Gives the combined heat of both a Furnace and Fireplace, with Perfect Ventilation. Equalizes the heat in every part of the room. Burns equally well Hard or Soft Coal, Wood or Coke. Address

OMEGA GRATE CO.,  
Pullman Building, Chicago, Ills.



BIBB'S Celebrated Original  
BALTIMORE  
FIRE-  
PLACE HEATERS  
To warm upper and lower rooms.  
The Handsomest and Most Eco-  
nomical Coal Stoves in the world.  
THE B. C. BIBB STOVE CO.  
Stove Founders, Baltimore, Md.  
MARBLEIZED SLATE MANTELS  
Send for Circulars and prices.

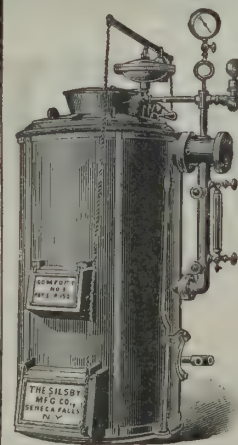
### Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish Plans and Specifications for Buildings of every kind, including Public Buildings, Churches, Schools, Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address

MUNN & CO., 361 Broadway, New York.

## STEAM HEATERS.



The most Reliable,  
Durable, and Econo-  
mical in the market.

Simple,  
Cheap,  
Safe.

Require no brick  
work.

Are absolutely auto-  
matic.

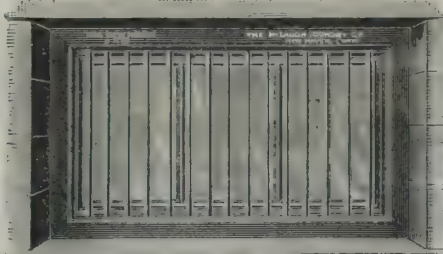
A servant or child can  
manage them.

Send for Illustrated  
Catalogue.

The Silsby Manuf'g Co.,  
221 FALL STREET,  
SENECA FALLS, N. Y.



Improved Iron Cellar Window Frame and Sash.  
Strong.  
Convenient.  
Attractive.  
Economical.



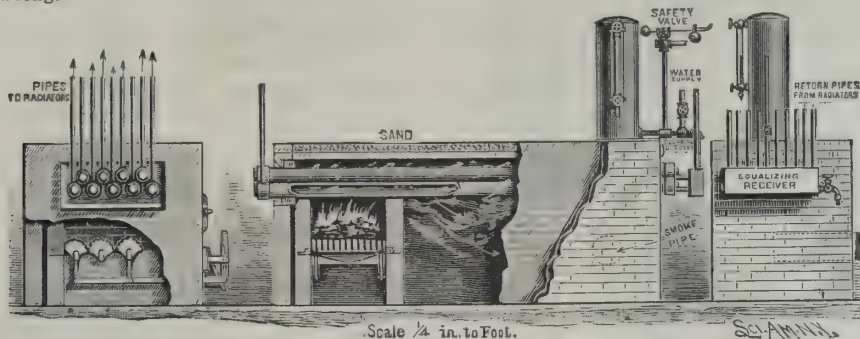
No Decay.  
No Swelling  
or Shrinking.  
No Warping.  
No Binding.

13 SIZES IN STOCK.

THE McLAGON FOUNDRY COMPANY, IRON FOUNDERS AND PATTERN MAKERS, NEW HAVEN, CT.

## GATES IMPROVED HOT WATER HEATER.

This is the only system of heating which, with cold weather and warm rooms, has smoke pipe only warm. I have never seen steam heater, furnace, or other hot water heater that would do this. Hence, greater economy of fuel over all others; and while this possesses every advantage that others have, this also has the positive circulation to each room due to the independent boiler system. Notice, this is the only system having tank for water supply in cellar, and will, for a month at a time, supply water automatically to each radiator. This works by air pressure. Improved noiseless circulation. Stops the overflow which is liable to occur with open tanks in upper rooms. No overflow to wet ceilings and ruin house. Perfect combustion of fuel, because no water comes around the fire, and more boiler surface exposed to fire than usual to do same work. Boilers for house heating each  $3\frac{1}{2}$  in. in diameter, 8 ft. 6 in. long.



SOME OF PARTIES USING THIS SYSTEM.

Senator Hartwell, Geo. F. Simonds, C. H. Whittemore, A. W. Baker, H. F. Coggeshall, E. A. Goodrich, Alonzo P. Goodrich, John M. Carpenter, David E. Rand, Fitchburg, Mass.; Dr. Hartwell, Ayer, Mass.; D. G. Hitchcock, Warren, Mass.; O. L. Cowles, J. U. Johnson, Springfield, Mass.; E. L. Lyman, J. G. Bishop, Holyoke, Mass.; S. P. Gardner, Haverhill, Mass.; Dr. E. E. Denniston, S. D. Drury, Geo. F. Drury, O. C. Bridgman, R. S. Bartlett, Northampton, Mass.; S. F. Snow, J. S. Wilcox, Deep River, Conn.; J. W. Rigdon, Topeka, Kansas; A. N. Stanton, Bridgeport, Conn.; Heslop & Curtis, A. C. Van Gilder, Point Pleasant, W. Va.; Mrs. A. E. Leonard, Westfield, Mass.; C. A. Gridley, So. Hadley, Mass.

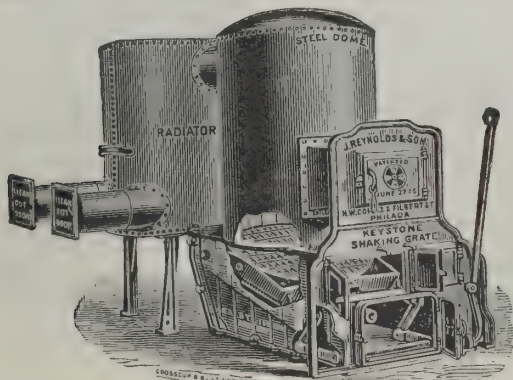
For full particulars and price, address

E. N. GATES, Box 1504, Fitchburg, Mass.

"The Best is the Cheapest."

"A Perfect Furnace at Last."

Keystone Steel Furnaces,  
Air Tight Steel Furnaces,  
Manufactured by J. REYNOLDS & SON,  
13th and Filbert Sts., Philadelphia.



These Furnaces are supplied with THE "REYNOLDS CLINKER CUTTING GRATE" with Patent Dumping Attachment, the best LABOR and FUEL SAVING invention ever applied to HEATING APPARATUS. It is perfection. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly GAS, SMOKE and DUST TIGHT.

SEND FOR CIRCULAR.

## Black Diamond Steel Dome Furnaces.

ALL SIZES.

PORTABLE and

BRICK SET.

Patent Self-Cleaning Ash Pit  
Obviates labor, dirt, and annoyance. Sure preventive from fire caused by hot ashes.

Common Sense Clinker-Crushing Grate. Great saving of labor and fuel.  
Perfect Dump.

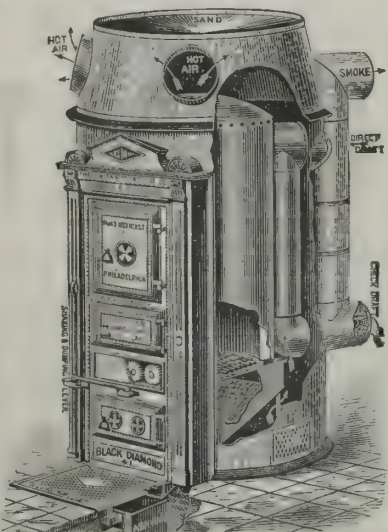
Patented and Manufactured by

Office and Salesroom

The Schoen Heater  
and Stove Co.

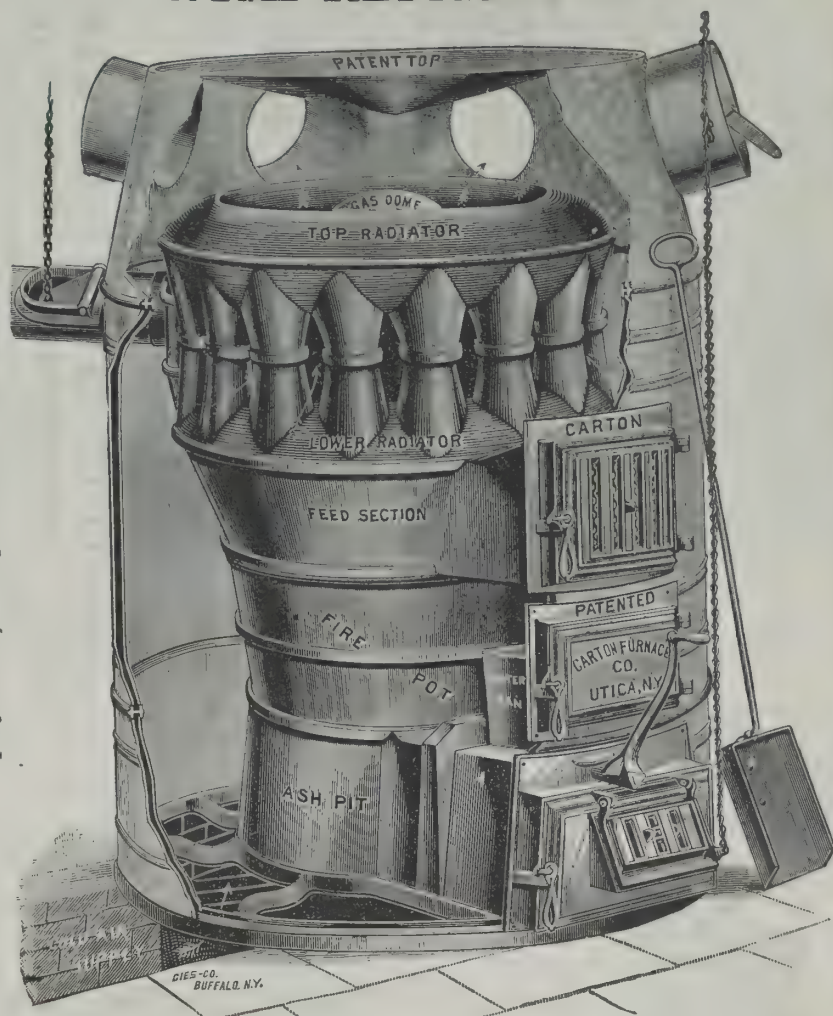
13 North Eleventh St.  
Philadelphia.

SEND FOR ILLUSTRATED CATALOGUE.  
AGENTS WANTED IN EVERY TOWN.



## NEW "CARTON"

WITH RETURN-FLUE.

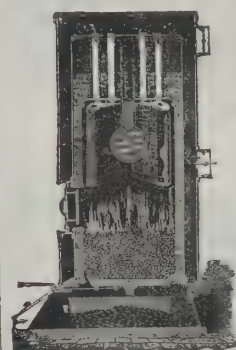


Return-Flue constructed without bolts, without dampers, without horizontal projections, and positively self-cleaning.

All Cast Iron. Surface. Self-cleaning. Two Radiators and No Bolts used. Immense Radiating "Duplex Grate," NO CLINKERS.

—New Catalogue for 1888 now ready. Send for one.—  
—Sole Owners and Manufacturers,—  
**CARTON FURNACE CO.**  
UTICA, N. Y.  
Established 1847. Incorporated 1883.

## The Globe Steam Heater



Has been thoroughly tried in many private and public buildings and always found to be the best. Very economical, and easily managed. Large surface exposed directly to the fire. Ask for all particulars before you place your order for any other.

THE GLOBE SAFETY DAMPER REGULATOR SHOULD BE USED ON EVERY STEAM HEATER IN USE.

For new Illustrated Price List of Globe Steam Heating Appliances, address

Globe Steam Heater Co., North Wales, Pa.

## ARCHITECTURAL PERSPECTIVES.

Architects and Builders who have plans which they desire to have put into perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

MUNN & CO., Scientific American Office, 361 Broadway, New York.

## PLANS and SPECIFICATIONS.

Full plans, specifications, and sheets of details, complete, ready for the builder, may be obtained at this office, for any of the structures illustrated in this publication. We also prepare plans for buildings of every description, including churches, colleges, schools, stores, dwellings, carriage houses, barns, etc.

We are assisted in this work by able architects, and we try to make our estimates reliable, so that the work can be done by any reliable builder at the prices named. Terms moderate.

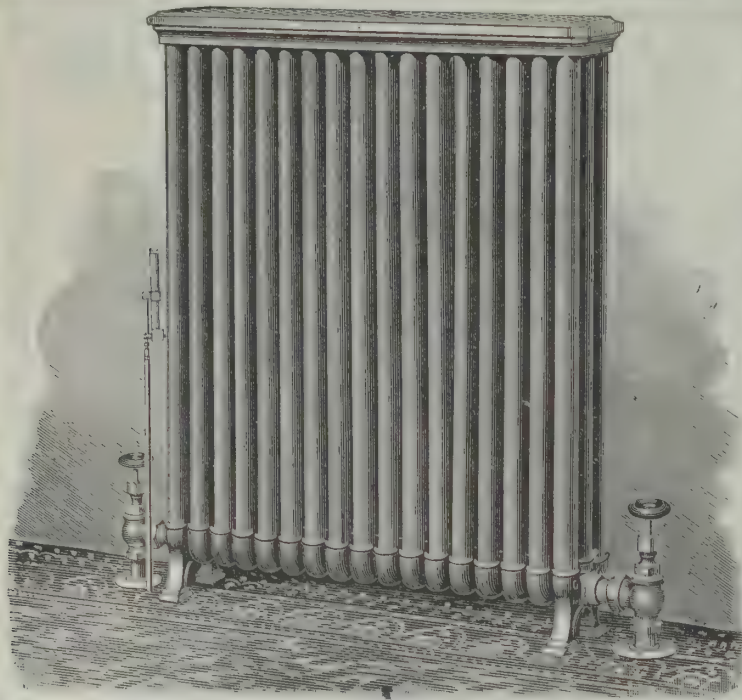
MUNN & CO., 361 Broadway, New York.

**THE BRIDGEPORT WOOD FINISHING CO**  
G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN.  
NEW YORK BUSINESS OFFICE, 96-98 MAIDEN LANE. MANUFACTURERS OF  
**WHEELERS PATENT WOOD FILLER.**  
BREINIG'S LITHOGEN SILICATE PAINT.  
LITHOGEN PRIMER, WOOD STAINS  
SILEX FLINT AND FELDSPAR.  
PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS

# ART STAINED GLASS

FOR CHURCHES, DWELLINGS, Etc.  
Keystone Stained Glass Works,  
271 SOUTH 5th ST., PHILADELPHIA.



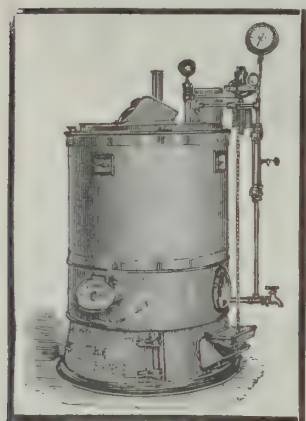


**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
 STEAM HEATING ENGINEERS.

Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.

## The Improved Auburn Boiler FOR STEAM OR HOT WATER.

Automatic, Self-Feeding, Portable.



Requires attention but once in from twelve to twenty-four hours. Fuel magazine surrounded by water. Self-locking shaking grate. Waste of coal impossible. No dust. No gas.

The Woodcock Patent Shaking Grate,  
 For Boiler Furnaces of all Descriptions

Saves its cost in a year, supplanting all other shaking grates. No waste of coal. No burnt or broken grates. Self-locking, and as nearly automatic as a grate can be made.

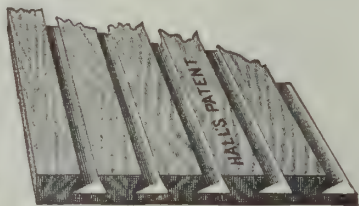
Send for Illustrated Catalogue.

Woodcock & Co., Auburn, N. Y.

## HOW TO BUILD A PERFECT HOME WITH VERY LITTLE COST.



USE  
 COMBINED  
 SHEATHING  
 LATH.



Hall's Patent.

It makes a cheaper, warmer and stronger house than brick or stone. It is a dry and therefore a healthy house. The plaster will not crack. Architects and Builders specify it all over the country.

ADDRESS

**The Byrkit-Hall Sheathing Lath Co.,**

226-228 LA SALLE STREET, Room 28, CHICAGO ILL.

For Eastern and New England States, address

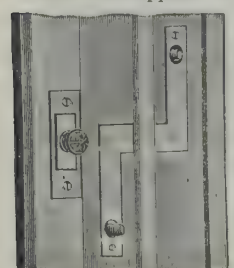
**I. G. JENKINS, OSWEGO, N. Y.**

**Timby's Burglar-Proof Sash Lock and Ventilator.**

Patented March 29, 1887.

Manufactured from the Best Malleable Iron, Steel, Brass and Bronze Metal.

Fig. 1.—Section of Frame with Lock Applied.



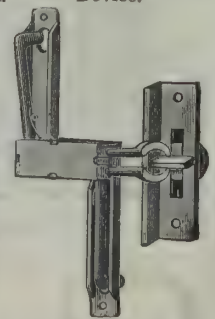
Is very simple in construction, strong and durable, absolutely Burglar-Proof, and a perfect Ventilator; automatic in action, easily applied to any window, as it adjusts itself to varying thicknesses of sash or inside stops.

Only One Lock is Required for a Window, as it controls both sash perfectly, bolting either or both securely in any position desired, thereby affording means for perfect ventilation, and at the same time absolute security against burglars and sneak thieves. It is easily operated, ornamental in appearance, and does not interfere with applying weather strips or inside blinds. It is just as important that each and every window should be provided with a good, substantial lock as that the front door should be. Buy the Timby Burglar-Proof, and take no other. The convenience and absolute security afforded will be ample reward. Full directions and pattern for setting accompany each lock.

For Price-List and further information, apply to

**JENKINS & TIMBY,**  
**OSWEGO, N. Y.**

Fig. 2.—Back View of Lock and Operating Device.



Thumb Nut moved upward and bolt thrown back, same as in Fig. 1.

## PANCOAST & ROGERS,

GENERAL AGENTS FOR

READING IRON WORKS, Wrought Iron Pipe, Boiler Tubes, Artesian and Oil Well Tubing, Casing, Line Pipe, etc. Special work of every kind in Wrought Iron.

CHAPMAN VALVE MFG. CO. Valves and Gates for Gas, Steam, Water, Oil, etc., 1/2" to 48" diam. Fire-Hydrants.

THE WATERBURY MALLEABLE IRON CO. Malleable and Gray Iron Fittings for Gas, Steam, and Water.

MANUFACTURERS' AGENTS FOR

CAST IRON WATER & GAS PIPES, SPECIAL CASTINGS, And Dealers in Supplies of Every Description.

Office & Warehouse, 28 Platt & 15 Gold Sts., New York.



## WILLER'S PATENT INSIDE SLIDING BLINDS

ARE ACKNOWLEDGED THE  
 STANDARD SLIDING BLINDS  
 OF THE COUNTRY.

They are used in preference to any other by the  
**LEADING ARCHITECTS.**

THEY ARE THE ONLY SLIDING BLINDS GIVING

Universal Satisfaction.

For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**

Sole Manufacturer,

Fourth and Cedar Streets, Milwaukee, Wis.

**AGENTS WANTED EVERYWHERE.**

State your business when writing for catalogue or agency.

## ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

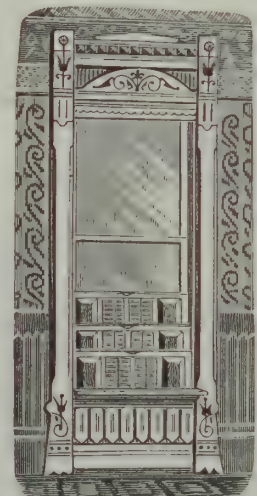
To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

**MUNN & CO., Publishers,**  
 361 Broadway, New York.

## HARTMAN'S PATENT INSIDE SLIDING WINDOW BLIND.



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

Agents wanted everywhere. Send for illustrated Catalogue and prices to

**Hartman & Durstine,**  
**WOOSTER,**

Ohio,

Mfrs for U. S. A.

**Withrow & Hillock,**  
**TORONTO, Can.,**  
 Mfrs. for the Dominion of Canada.



HALF SIZE.  
 Pat. Nov. 15, '87.

## THE CHAMPION SAFETY SASH LOCKS.

These locks are being received with universal and enthusiastic approval by Architects, Builders, and Hardware Dealers everywhere. All bear testimony to their unequalled merits.

Salesmen wanted. — For further information, address the sole manufacturers,

**THE CHAMPION SAFETY LOCK CO.,**

106 & 108 Canal St., CLEVELAND, OHIO.



## REFRIGERATORS.

Estimates furnished (under new construction) for

Hotels, Stores and Butchers' Use

ALSO A LINE

**FOR RESIDENCES,**

BY

**FRANK W. LOCKWOOD,**

240 South Second St., Philadelphia.



## THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.

### TILES.

NEW PRINCIPLE. Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

### SHINGLES.

Gothic Pattern. The BEST SHINGLE ever offered to the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

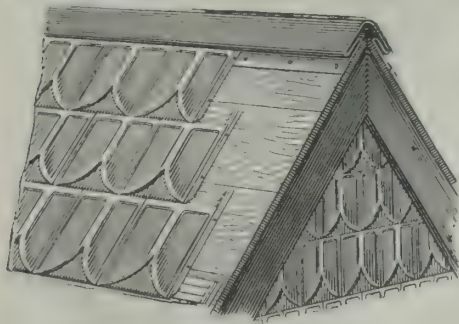
Illustrated Catalogue mailed to any address on application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.



Shield Tiles as laid on roof with Roll Ridge Coping.



Our Gothic Shingle and Plain Ridge Coping.



THESE are in every respect strictly first-class. Paints, composed of pure linseed oil and the highest grade of pigments. They are prepared ready for the brush, in 54 newest shades and standard colors, and, on account of their purity and great covering properties, we offer them as the MOST DURABLE and ECONOMICAL Paints ever produced. One gallon will cover from 250 to 275 sq. ft., two coats.

Samples and Descriptive Price List free by mail.

H. W. JOHNS MANUFACTURING COMPANY,  
SOLE MANUFACTURERS OF

H. W. Johns' Colors in Oil, Liquid Coach Black, Asbestos Roofing, Fire-Proof Paints, Building Felt, Steam-Pipe and Boiler Coverings, etc. Vulcabeston Piston Rod Packing Rings, Gaskets, etc.

87 MAIDEN LANE, NEW YORK.

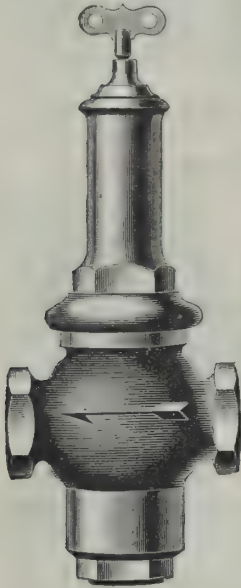
Chicago, Philadelphia, London.

## OUR REDUCING VALVE

Is the standard used by the American and Southern Cotton Oil Companies and all the Sugar Refineries.

MASON  
REGULATOR  
CO.,  
BOSTON.

Steam Regulating  
Devices.

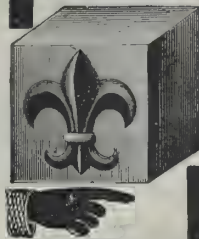


## PEERLESS BRICK CO.

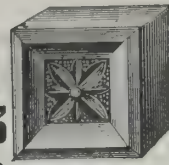
PHILADELPHIA, PA.

1003 WALNUT ST.

WORKS—70 Acres—Old York Road and  
Nictown Lane.



PLAIN, PRESSED FRONT,  
ORNAMENTAL & MOLDED  
BRICKS



MADE OF  
THOROUGHLY TEMPERED CLAY.

16,000,000 Bricks Annually.

5,000,000 PRESSED FRONT BRICKS,

600 DIFFERENT DESIGNS AND SHAPES.

VARIOUS SIZES, COLORS, AND SHADES.



Red, Buff, Drab, Brown, Gray,  
Black, White and Pompeian.

Orders filled for large quantities of PRESSED FRONT or FACE BRICKS of any one shade.

BRICK FIRE PLACES and MANTELS.

ARCHES of all kinds ground and fitted from drawings furnished to us. Full size working plans sent with bricks.

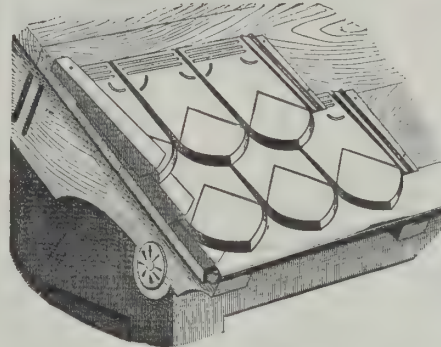
SPECIAL SHAPES made from designs furnished us by Architects. Bricks shipped in cars at our works for all parts of the country. Illustrated Catalogue and Price List sent on application.



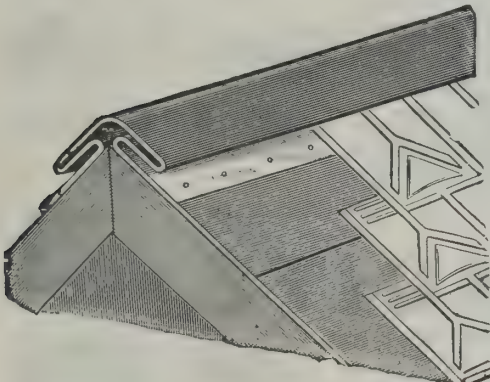
## Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Cooper's Patent Queen Anne Metallic Shingles.



Walter's Patent Standard Metallic Shingles.

### WHOLESALE AGENTS.

W. W. MONTAGUE & Co., San Francisco, Cal., Pacific Coast.

PHILLIPS & BUTTORFF MFG. CO., Nashville, Tenn.

MCDONALD, KEMP & Co., Toronto, Sole Agents, Canada.

KNISELY & MILLER, Chicago, Ill.

J. J. WALTERS, Denver, Col.

JEROME TWICHELL & Co., Kansas City, Mo.



THE NATIONAL SHEET METAL ROOFING CO.,

510, 512, 514, 516, 518 & 520 East 20th St., New York.

## USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has just been published for free circulation at the office of this paper. Subjects classified, with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them.

### TITLE OF SUBJECTS:

AGRICULTURE.  
ANATOMY & PHYSIOLOGY.  
ANIMALS, DOMESTIC.  
ARCHITECTURE & BUILDING.  
ANALYSIS AND ASSAYING.  
ASTRONOMY.  
BOTANY, ZOOLOGY, Etc.  
BREWING AND DISTILLING.  
CABINET MAKING, CARVING, AND TURNING.  
CARPENTRY.  
CHEMISTRY.  
CIVIL ENGINEERING.  
COOKING.

DICTIONARIES AND CYCLOPEDIAS.  
DRAWING, ETCHING, ENGRAVING, Etc.  
DYEING AND PRINTING.  
ELECTRICITY.  
FISHING, SHOOTING, Etc.  
GAS.  
GEOLOGY & MINERALOGY.  
HEAT.  
HORTICULTURE AND ARBORICULTURE.  
HOROLOGY.  
HYDRAULICS.  
LAW.  
LEATHER.

MATHEMATICS AND SURVEYING.  
MACHINERY.  
MARINE ENGINEERING.  
MECHANICS.  
MEDICINE AND SURGERY.  
MENTAL SCIENCE.  
METALLURGY.  
MICROSCOPY.  
MILLS AND MILLING.  
MILITARY ENGINEERING.  
TACTICS, Etc.  
MINING.  
MISCELLANEOUS.  
MOULDING AND FOUNDING.  
NATURAL HISTORY, Etc.

NAVIGATION.  
PAINTING.  
PERFUMERY.  
PHOTOGRAPHY.  
PHYSICS.  
POLITICAL ECONOMY.  
POTTERY.  
SANITARY ENGINEERING.  
SCIENCE SERIES.  
STEAM ENGINEERING.  
STEEL AND IRON.  
STONE.  
TAXIDERMY.  
TEXTILE MANUFACTURES.  
TECHNOLOGY.

Address MUNN & CO., 361 Broadway, New York.

## MARSTON'S IMPROVED Hand and Foot Power Band Saw.

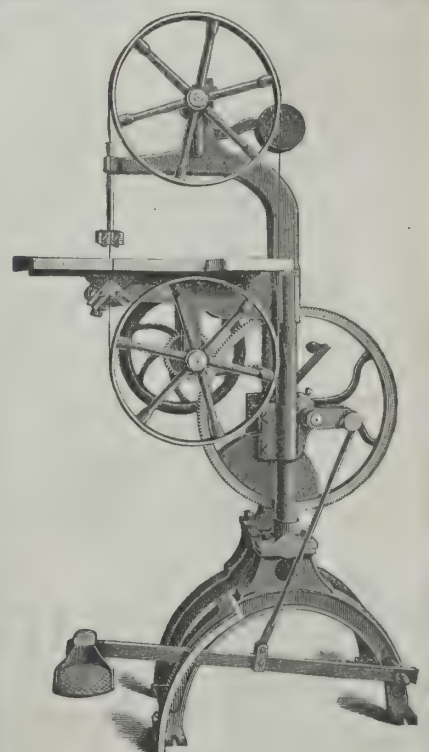


Table is 3 feet 6 inches from floor; measures 18 x 21 inches; is adjustable for cutting on a bevel. Guide for saw both above and below table. Distance from table to guide when raised its full height, 5 inches; 16 inches between saw and frame. All gears cut from solid iron. Shafts are made of steel. Saw pulleys covered with rubber. Upper saw pulley has adjustment to bring it into line with lower saw pulley. Weight of machine, 200 lbs. Machines on trial.

J. M. MARSTON & CO.,  
Cor. Appleton & Tremont Sts.,  
Boston, Mass.

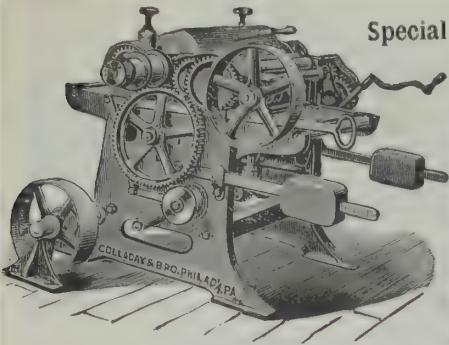
# SENECA FALLS PUMP & FIRE APPARATUS WORKS

PUMPS FOR ALL PURPOSES

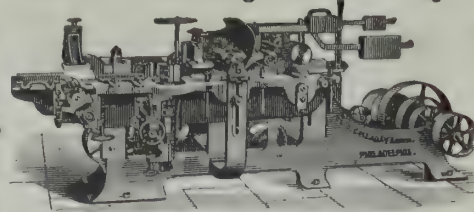
# FIRE APPARATUS WORKS

RUMSEY & CO. (LIMITED) PROPRIETORS, SENECA FALLS, N.Y. U.S.A.





Special Wood Working Machinery



For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc.  
 Manufact'd by **Joseph O. Colladay & Bro.,**  
 Nicholson & Race Street, Philadelphia.

**E. P. WILCE & CO.,**

MANUFACTURERS OF

**DOORS, SASH AND BLINDS**

FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

Stair Work and Interior Finish, Mantels, Sideboards, Pulpits,  
 Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets,

**CHICAGO.**

### SEALED PROPOSALS.

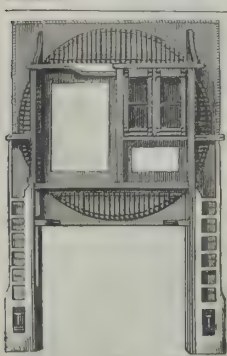
June 2, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 2d day of July, 1888, for the labor and materials required in the erection and completion of the U. S. Court House, Post Office, etc., at Augusta, Ga. (except heating apparatus), in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Association at Baltimore, Md.; Builders' and Traders' Exchange, Louisville, Ky.; Mechanics' Dealers', and Lumbermen's Exchange, New Orleans, La.; Va. Mechanics' Institute, Richmond, Va.; Builders' and Dealers' Exchange, Charleston, S. C.; Supt. U. S. Custom House, Atlanta, Ga.; and office of Superintendent, Court House, and Post Office, Macon, Ga. Each bid must be accompanied by a certified check for \$500. WILL. A. FRERET, Supervising Architect.

June 12, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 10th day of July, 1888, for the labor and materials required in the erection and completion of the buildings and wharfs for a Quarantine Station on North Chaudaleur Island, Gulf of Mexico, in accordance with the specification and drawings, copies of which may be seen on application at this office, the office of the Superintendent of Repairs, New Orleans, La.; Builders' Exchanges at Charleston, S. C. and Memphis, Tenn.; Mechanics' Dealers', and Lumbermen's Exchange, New Orleans, La.; office of Superintendent of Repairs, Old Custom House, St. Louis, Mo.; office of Superintendent of Custom House, etc., Galveston, Tex.; offices of Custodians, Custom House, Mobile, Ala., and Court House, Pensacola, Fla. Each bid must be accompanied by a certified check for \$200. WILL. A. FRERET, Supervising Architect.

June 22, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 21st day of July, 1888, for the labor and materials required in the completion of the Approaches for the U. S. Post Office, Court House, etc., building at Auburn, N. Y., from the first story sill course, including interior finish, entrance steps, etc., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Exchange, Albany, N. Y.; Master Builders' Association at Boston, Mass., and Baltimore, Md.; Mechanics' and Traders' Exchange, Brooklyn, N. Y., and New York City, N. Y.; Builders' Exchanges at Cincinnati, O., and Pittsburgh, Pa.; and the Builders' Association, Buffalo, N. Y. Each bid must be accompanied by a certified check for \$300. Upon receipt at the office of the Supervising Architect, Treasury Department, of a post office money order in amount five dollars, payable to the Treasurer of the U. S., parties will be furnished with copies of specification and plans. WILL. A. FRERET, Supervising Architect.

June 23, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 23d day of July, 1888, for the labor and materials required for the extension and completion of the Post Office, etc., building at Brooklyn, N. Y., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Association at Boston, Mass., and Baltimore, Md.; Builders' Association, Buffalo, N. Y.; Builders' Exchange, Cincinnati, O.; Builders' and Traders' Exchange, Chicago, Ill.; Master Builders' Exchange, Philadelphia, Pa.; Engineers' Society of Western Pennsylvania, Pittsburgh, Pa.; and the Mechanics' and Traders' Exchange, New York, N. Y. Each bid must be accompanied by a certified check for \$1,000. Upon receipt at the office of the Supervising Architect, Treasury Department, of a post office money order in amount five dollars, payable to the Treasurer of the U. S., parties will be furnished with copies of specification and plans. WILL. A. FRERET, Supervising Architect.

June 23, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 23d day of July, 1888, for the labor and materials required for the extension and completion of the Post Office, etc., building at Brooklyn, N. Y., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Association at Boston, Mass., and Baltimore, Md.; Builders' Association, Buffalo, N. Y.; Builders' Exchange, Cincinnati, O.; Builders' and Traders' Exchange, Chicago, Ill.; Master Builders' Exchange, Philadelphia, Pa.; Engineers' Society of Western Pennsylvania, Pittsburgh, Pa.; and the Mechanics' and Traders' Exchange, New York, N. Y. Each bid must be accompanied by a certified check for \$1,000. Upon receipt at the office of the Supervising Architect, Treasury Department, of a post office money order in amount five dollars, payable to the Treasurer of the U. S., parties will be furnished with copies of specification and plans. WILL. A. FRERET, Supervising Architect.



**Mankey Decorative Company,**  
 Incorporated Sept. 9, 1885. **Williamsport, Pa.,** CAPITAL \$100,000.  
 —MANUFACTURERS OF—

Artistic Wood Decorations for Public and Private Buildings

MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

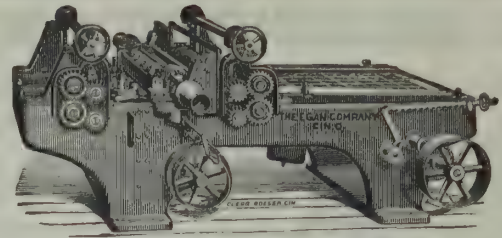
**WOOD MANTELS and DOORS A SPECIALTY.**

Eight Foot Eave Trough  
 and Gutters.



**HATTEN, GALPIN & CO.,**  
 BINGHAMTON, N. Y.

**E  
F  
F  
I  
C  
I  
E  
N  
T**



No. 3 Planer and Matcher.

**D  
U  
R  
A  
B  
L  
E**

**THE  
EGAN COMPANY,**

BUILDERS OF

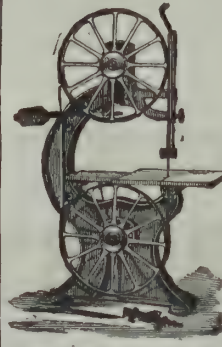
**Woodworking  
Machinery**

For Builders, Carpenters,  
 Planing Mills, and General  
 Woodworkers.

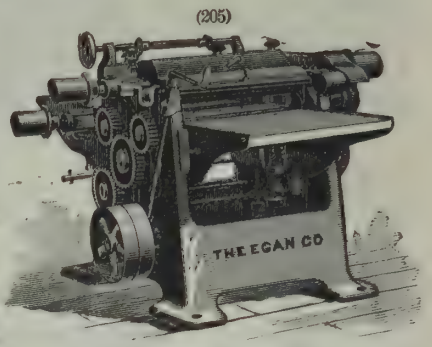
209 to 229 W. Front St.

Cincinnati, Ohio, U. S. A.

Complete Outfits Furnished.  
 Write for Catalogue & Prices

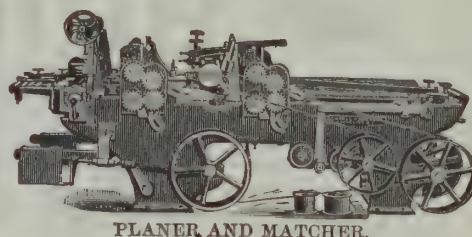


No. 2 Band Saw.

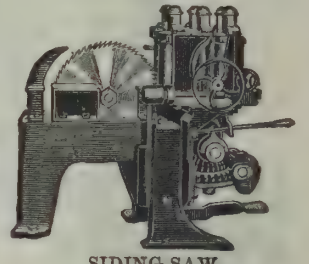


No. 2 1/2 Double Cylinder Planer.  
 Planes 26 inches wide and 6 inches thick.

**Woodworking Machinery, Planers and Matchers, Pony Planers,  
 Hand Matchers, Solid Plate and Segment Re-Saws.**

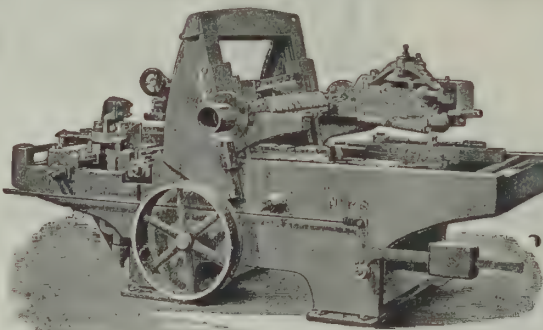


PLANER AND MATCHER.



SIDING SAW.

**CONNELL & DENCLER, Rochester, New York.**



**HOYT & BROTHER CO.**  
**AURORA, ILL.**

MANUFACTURERS OF

**Machinery for Working Wood.**

Planing Mill Machinery  
 a Specialty.

Send for Catalogue.

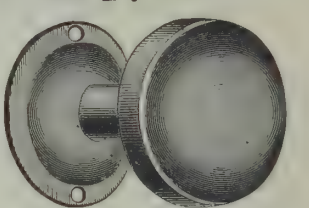
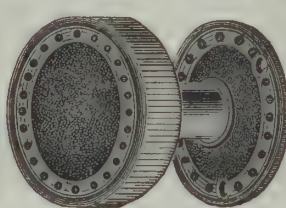
**HEMACITE.**

Easily the Best and  
 Handsomest  
 Interior Door-Handle

Address

**DIBBLE MFG. CO.,**

Trenton, N. J.



**WOOD MANTELS,**

—INTERIOR—

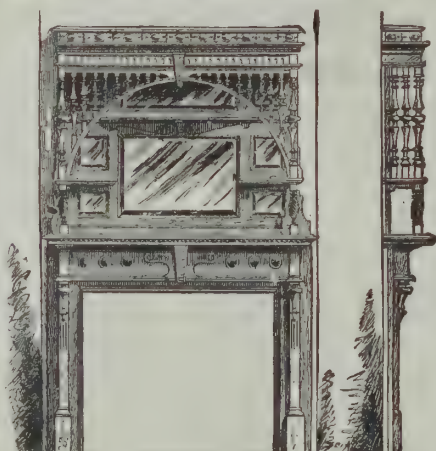
**HARD \* WOOD \* DECORATIONS,  
 FURNITURE.**

DESIGNS & ESTIMATES  
 FURNISHED BY

**FRANCIS D. KRAMER,**

1601-1615 Spring Garden Street, Philadelphia.

BRANCH OFFICES:—200-210 La Grange Street, Phila. 36 North 2d Street, Phila. 1416 F St., Washington, D. C.



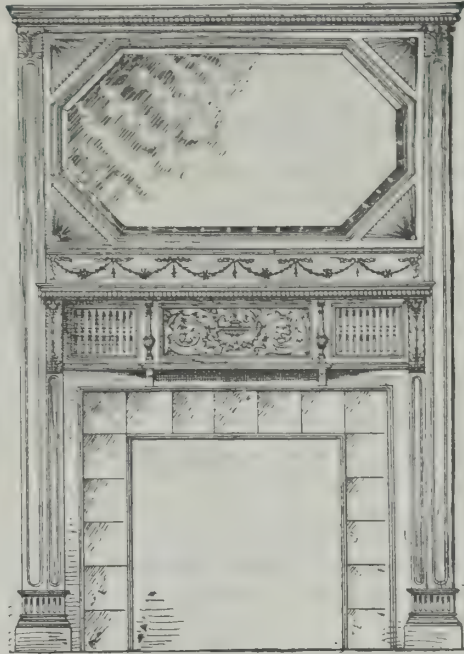


NORTHROP'S PATENT paneled iron ceiling.



Engraving

Far surpassing either plaster or wood ceilings. These ceilings can be laid over old broken plaster as well as on new work. These ceilings are covered by 6 original patents. Send for Illustrated Circulars and Price Lists.  
A. NORTHROP & CO., Sole Manufacturers, Pittsburgh, Pa.



KEELER & CO.,

WOOD MANTELS

—AND—

FURNITURE,

Made from our own or architect's drawings.

81-91 Washington St.,

Cor. Elm,

Boston, Mass.

"Alsop" Warm-Air and Combination Warm-Air and Steam Furnace

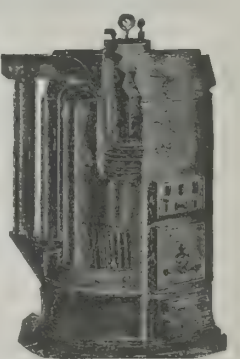
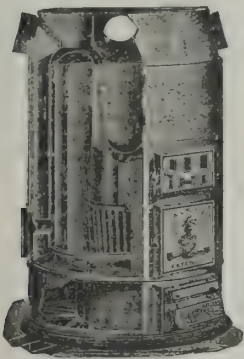
THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

IN OFFERING this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a new departure in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation.

Manufactured by the ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.



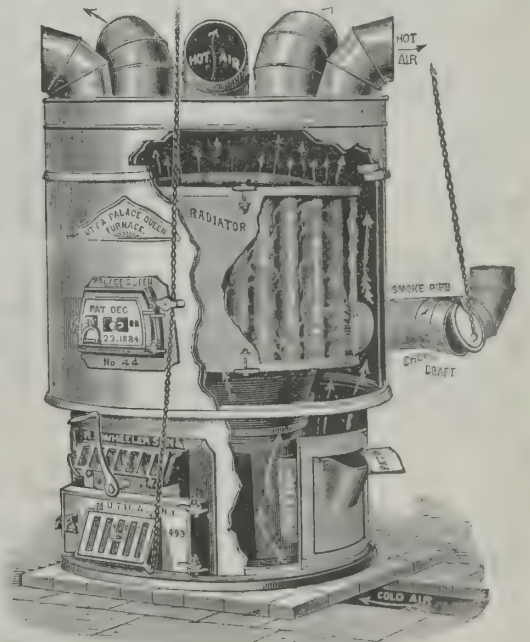
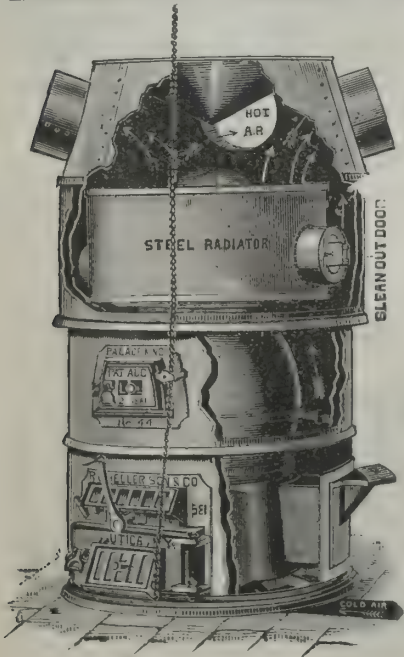
Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

<b>Adjustable Clapboard Marker.</b> Stanley Rule & Level Co. ....cover ii	<b>Black Varnish.</b> M. Ehret, Jr., & Co. ....cover iv	<b>Chandeliers.</b> I. P. Frink ..... ii	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co. ....i
<b>Adjustable Planes.</b> Stanley Rule & Level Co. ....cover ii	<b>Boiler Coverings.</b> Asbestos Packing Co. ....cover ii	<b>Clapboard Marker.</b> Stanley Rule & Level Co. ....cover ii	<b>Electric Lights.</b> The Thomson-Houston Electric Co. ....cover iii
<b>Advertising Glass Signs.</b> The Western Sand Blast Co. ....iii	M. Ehret, Jr., & Co. ....cover iv	<b>Combination Dividers.</b> L. S. Starrett .....vi	<b>Electrical Supplies.</b> Patrick & Carter .....vii
<b>Annunciators.</b> Patrick & Carter .....vii	Shields & Brown .....iii	<b>Contractor and Builder.</b> Allen B. Rorke .....iv	Shaw & Geary .....cover iv
<b>Architects' and Surveyors' Supplies.</b> L. Manasse .....iv	H. W. Johns Mfg. Co. ....xi	<b>Cordage.</b> J. P. Tolman & Co. ....cover ii	<b>Elevators.</b> L. S. Graves & Co. ....v
<b>Architects.</b> C. Powell Karr, C.E. ....iv	<b>Booksellers and Publishers.</b> J. B. Lippincott & Co. ....vi	<b>Corrugated Iron Lath.</b> The Cincinnati Corrugating Co. ....ii	Henry H. Hill .....ii
Smith, F. L. ....iii	Tieknor & Co. ....vi	Canton Iron Roofing Co. ....iv	Howard Iron Works .....v
<b>Architectural Iron Work.</b> Cheney & Hewlett .....iv	John Wiley & Sons .....vi	N. S. Northrop .....ii	Morse, Williams & Co. ....ii
Manly & Cooper Mfg. Co. ....iv	<b>Brass Goods.</b> C. H. Besly & Co. ....ii	A. Northrop & Co. ....xiii	<b>Engineers' Supplies.</b> L. Manasse .....iv
<b>Architectural Wood Turning.</b> Anderson & Dickey .....iv	<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.) ....cover iii	Sykes Iron Roofing Co. ....iv	<b>Feed Water Heaters.</b> Stewart Heater Co. ....cover ii
Standard Wood Turning Co. ....iv	<b>Brick.</b> Chicago Anderson Pressed Brick Co. ....xi	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr., & Co. ....cover iv	<b>Fire Apparatus.</b> Rumsey & Co. ....xi
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.) ....cover iii	Peerless Brick Co. ....xi	H. W. Johns Mfg. Co. ....xi	<b>Fire Brick.</b> Henry Maurer & Son .....iii
<b>Artistic Wood Decorations.</b> Keeler & Co. ....xiii	<b>Brick Machinery.</b> Henry Martin .....v	Shields & Brown .....iii	<b>Fireproof Building Materials.</b> Henry Maurer & Son .....iii
Mankey Decorative Co. ....xii	<b>Building Paper, Felt, Etc.</b> Asbestos Packing Co. ....cover ii	Western Mineral Wool Co. ....v	<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co. ....xi
Francis D. Kramer .....xii	M. Ehret, Jr., & Co. ....cover iv	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot .....xiv	Canton Iron Roofing Co. ....iv
E. P. Wilce & Co. ....xii	Warren-Ehret Co. ....cover iii	<b>Cutter Heads.</b> Sam'l J. Shimer .....iv	<b>Fireproofing Material.</b> Asbestos Packing Co. ....cover ii
<b>Artists' Materials.</b> F. W. Devoe & Co. ....i	H. F. Watson .....cover iii	<b>Door Knobs.</b> Dibble Mfg. Co. ....xii	H. W. Johns Mfg. Co. ....xi
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr., & Co. ....cover iv	<b>Builders' Scroll Saw.</b> W. F. & J. Barnes Co. ....ii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co. ....xii	<b>Foot and Hand Power Machinery.</b> W. F. & J. Barnes Co. ....ii
Warren Chemical and Mfg. Co. ....vii	<b>Cabinet Woods and Veneers.</b> J. Rayner .....vii	E. P. Wilce & Co. ....xii	C. E. Little .....ii
<b>Asbestos.</b> Asbestos Packing Co. ....cover ii	<b>Cables.</b> Standard Underground Cable Co. ....i	<b>Door Hangers.</b> Lane Bros. ....vii	J. M. Marston & Co. ....xi
H. W. Johns Mfg. Co. ....xi	<b>Carbide of Lime.</b> M. Ehret, Jr., & Co. ....cover v	<b>Drawing Instruments, Etc.</b> G. S. Woolman .....iv	Fred. A. Rich .....iv
<b>Auger Bits.</b> Bridgeport Gun Implement Co. ....ii	<b>Carpenters' Machinery.</b> Fred. A. Rich .....iv	L. Manasse .....iv	Sebastian May & Co. ....vi
<b>Automatic Air Valves.</b> Thos. L. McKeen .....ii	<b>Carpenters' Tools.</b> Stanley Rule and Level Co. ....cover ii	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co. ....ii	Seneca Falls Mfg. Co. ....ii
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co. ....iv	<b>Carpet Lining.</b> Warren-Ehret Co. ....cover iii	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co. ....v	<b>Furnaces.</b> Abram Cox Stove Co. ....cover iii
Anderson & Dickey .....iv	H. F. Watson .....cover iii	M. B. Swezey .....ii	Barstow Stove Co. ....viii
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts .....v	<b>Cements.</b> H. W. Johns Mfg. Co. ....xi	<b>Eave Trough and Gutters.</b> Hatten, Galpin & Co. ....xii	Boynston Furnace Co. ....viii
	M. Ehret, Jr., & Co. ....cover iv		Alsop Furnace and Stove Co. ....xiii
			Canton Furnace Co. ....ix
			E. A. Jackson & Bro. ....cover ii
			Leibbrandt & McDowell Stove Co. ....i
			Omega Grate Co. ....viii
			J. F. Pease Furnace Co. ....i

PALACE KING  
—AND—  
PALACE QUEEN  
WARM AIR FURNACES.

SEND FOR CATALOGUE.

RUSSEL WHEELER, SON & COMPANY,  
UTICA, N. Y.



CHILTON PAINTS.

{ The Chilton Manuf' Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application.

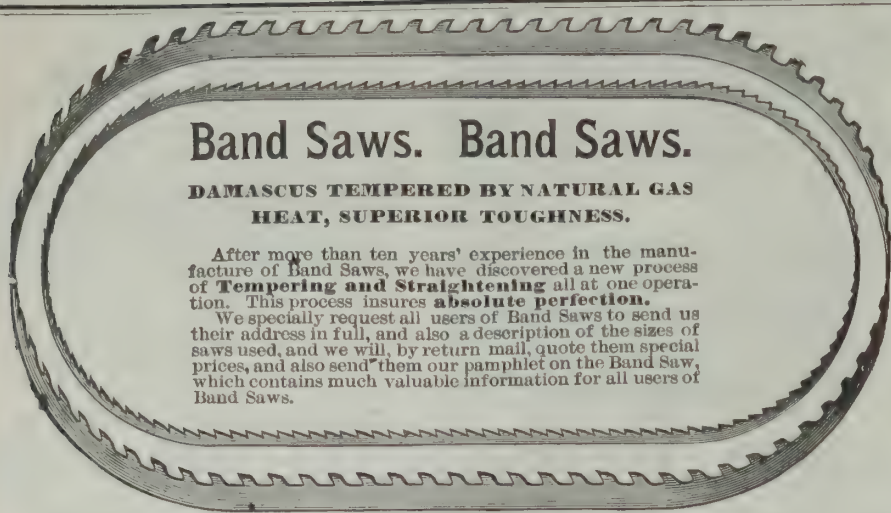
{ 147 Fulton St., New York.  
141 Milk Street, Boston.



### Band Saws. Band Saws.

**DAMASCUS TEMPERED BY NATURAL GAS  
HEAT, SUPERIOR TOUGHNESS.**

After more than ten years' experience in the manufacture of Band Saws, we have discovered a new process of **Tempering and Straightening** all at one operation. This process insures **absolute perfection**. We specially request all users of Band Saws to send us their address in full, and also a description of the sizes of saws used, and we will, by return mail, quote them special prices, and also send them our pamphlet on the Band Saw, which contains much valuable information for all users of Band Saws.



The Superior Quality of our Band Saws, All Tempered, Straightened, and Trued at one operation, which we have patented, makes them so perfect that our **SALES HAVE MORE THAN TREBLED IN THE PAST YEAR.** Our largest and best customers prefer them to the best imported saws.

WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.

NATURAL GAS

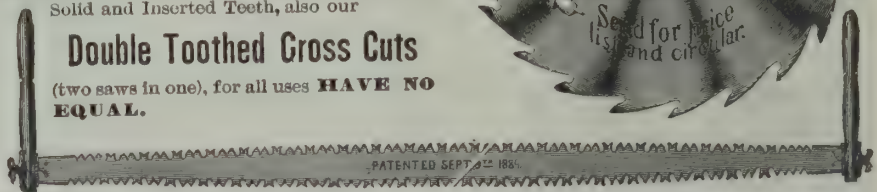
Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

OUR CIRCULAR SAW

Of all sizes from 6 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

Double Toothed Cross Cuts

(two saws in one), for all uses **HAVE NO EQUAL.**



Our SAWYER'S HANDBOOK will be sent **FREE** to any part of the world on receipt of full name and address.

Address **EMERSON, SMITH & CO. (LIMITED),**  
**Beaver Falls, Pa.**

CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

<b>Furnaces.</b> J. Reynolds & Son.....ix Richardson & Boynton Co.....viii R. Wheeler, Son & Co.....xiii Schoen Heater and Stove Co.....ix	<b>Furniture.</b> Keeler & Co.....xiii Francis D. Kramer.....xii	<b>Gas Engines.</b> Economic Gas Engine Co.....cover ii Williams & Orton Mfg. Co.....ii	<b>Gas Fires.</b> H. P. Dixon & Co.....cover iv	<b>Gas and Water Pipes.</b> Gloucester Iron Works.....v Mellert Foundry & Machine Co.....cover iii Pancoast & Rogers.....x Penna. Pipe Mfg. Co.....cover iv	<b>Glass—Plate.</b> Malaga Glass & Mfg. Co.....cover iv Pittsburg Plate Glass Co.....vii P. Semmer & Co.....iii	<b>Glass—Stained and Mosaic.</b> Beacon Stained Glass Works.....iii Alfred Godwin.....cover ix Keystone Stained Glass Works.....ix C. H. Postel & Co.....cover iii William Reith.....cover iii F. J. Riester.....cover iii Tiffany Glass Co.....vi	<b>Greenhouse Boilers.</b> Peter Devine.....ii Hitchings & Co.....cover ii New York Central Iron Works.....cover iii	<b>Ground &amp; Rough Glass for Floors, Etc.</b> Pittsburg Plate Glass Co.....vii	<b>Gymnastic Apparatus.</b> Narragansett Machine Co.....xiv	<b>Gypsum Paint.</b> John Maxwell.....iii	<b>Hand Sawing Machines.</b> W. F. & J. Barnes Co.....ii	<b>Heating Apparatus.</b> Abram Cox Stove Co.....cover iii Alsop Furnace and Stove Co.....xiii Barstow Stove Co.....viii B. C. Bibb Stove Co.....viii Boynton Furnace Co.....viii Broomell & Sanks.....x Carton Furnace Co.....ix Duplex Steam Heater Co.....vi E. N. Gates.....ix Globe Steam Heater Co.....ix Gurney Hot-Water Heater Co.....ii Hitchings & Co.....cover ii E. A. Jackson & Bro.....cover ii Leibrandt & McDowell Stove Co.....i National Hot Water Heater Co.....viii New York Central Iron Works.....cover iii Omega Grate Co.....viii J. F. Pease Furnace Co.....i Pierce, Butler & Pierce.....cover iv J. Reynolds & Son.....ix Richardson & Boynton Co.....viii Schoen Heater and Stove Co.....ix Silsby Mfg. Co.....viii B. F. Sturtevant.....viii Weston Engine Co.....cover iii R. Wheeler, Son & Co.....xiii Woodcock & Co.....x	<b>Iron Cellar Window Frame and Sash.</b> McLagon Foundry Co.....ix	<b>Iron Work for Building Purposes.</b> Cheney & Hewlett.....iv Composite Iron Works.....cover ii Manly & Cooper Mfg. Co.....iv Mellert Foundry & Machine Co.....cover iii	<b>Levelling Instruments.</b> John W. Harmon.....ii	<b>Lithographers.</b> Schumacher & Ettlinger.....cover ii	<b>Mahogany and Veneers.</b> J. Rayner.....vii	<b>Mail Chutes.</b> The Cutler Mfg. Co.....cover ii	<b>Mantels, Grates, Fire Places, Etc.</b> E. J. Johnson.....vii Chas. B. Kline.....v	<b>Masons' and Builders' Supplies.</b> S. H. French & Co.....iii	<b>Mathematical Instruments.</b> F. W. Devoe & Co.....i	<b>Metal Signs.</b> Joseph Neumann Co. (Ltd.).....cover iii	<b>Metallic Roofing Tiles and Shingles.</b> Cortright Metal Roofing Co.....xi Gummey, Sperring & Co.....cover iv Metallic Hip Shingle Co.....vii National Sheet Metal Roofing Co.....xi Thorn Shingle and Ornament Co.....iii	<b>Mineral Wool.</b> U. S. Mineral Wool Co.....v Western Mineral Wool Co.....v	<b>Mortar Colors.</b> S. Bowen's Sons.....v S. H. French & Co.....v	<b>Office and Bank Fittings.</b> A. H. Andrews & Co.....iii	<b>Oil Well Supplies.</b> Oil Well Supply Co.....iii	<b>Ornamental Brick.</b> Chicago Anderson Pressed Brick Co.....xi Peerless Brick Co.....xi	<b>Ornamental Glass Work.</b> C. H. Postel & Co.....cover iv The Western Sand Blast Co.....iii	<b>Ornamental Iron Work.</b> Manly & Cooper Mfg. Co.....iv	<b>Ornamental Rustic Work.</b> John Wheeler.....iv	<b>Packing Materials.</b> Asbestos Packing Co.....cover ii	<b>Paints.</b> The Chilton Mfg. Co.....xiii F. W. Devoe & Co.....i S. H. French & Co.....iii H. W. Johns Mfg. Co.....xi Prince Mfg. Co.....cover iii The Standard Paint Co.....cover iv	<b>Paneled Sheet Iron Ceiling.</b> H. S. Northrop.....ii	<b>Parquet Floors.</b> J. Dunfee & Co.....vii	<b>Patents.</b> Munn & Co.....xi	<b>Pavement Lights.</b> Manly & Cooper Mfg. Co.....iv	<b>Photographic Outfits.</b> E. & H. T. Anthony & Co.....ii	<b>Planing Mill Machinery.</b> Hoyt & Bro. Mfg. Co.....iii	<b>Polished Plate Glass.</b> Pittsburgh Plate Glass Co.....vii	<b>Porous Terra Cotta.</b> Henry Maurer & Son.....iii	<b>Porous Earthenware.</b> Henry Maurer & Son.....iii	<b>Portland Cement.</b> Howard Fleming.....v Lesley & Trinkle.....cover iv	<b>Poultry Yard Appliances.</b> S. S. Bent & Son.....iv	<b>Pressed Roofing.</b> M. Ehret, Jr., & Co.....cover iv H. F. Watson.....cover iii	<b>Pressed Brick.</b> Chicago Anderson Pressed Brick Co.....ii	<b>Pumps.</b> Goulds Mfg. Co.....cover iv Rumsey & Co.....xi	<b>Pumping Engines.</b> Economic Gas Engine Co.....cover ii	<b>Railing Iron.</b> Manly & Cooper Mfg. Co.....iv	<b>Recording Thermometer.</b> The Draper Mfg. Co.....iv	<b>Reflectors.</b> I. P. Frink.....ii	<b>Refrigerators.</b> F. R. Lockwood.....x Ridgway Refrigerator Mfg. Co.....i	<b>Roof Snow Guards.</b> John H. Hiller.....cover ii	<b>Roofing Paper, Etc.</b> Asbestos Packing Co.....cover ii M. Ehret, Jr., & Co.....cover iv H. W. Johns Mfg. Co.....xi The Standard Paint Co.....cover iv Warren-Ehret Co.....cover iii Warren Chemical & Mfg. Co.....vii H. F. Watson.....cover iii	<b>Roofing Slate.</b> E. J. Johnson.....vii The Old Bangor Slate Co.....vi	<b>Roofing Tin.</b> Gummey, Sperring & Co.....xi & cover iv N. & G. Taylor Co.....cover iv	<b>Roofing and Wall Tiles.</b> Canton Iron Roofing Co.....iv Cortright Metal Roofing Co.....xi The National Sheet-Metal Roofing Co.....xi The Standard Paint Co.....cover iv Thorn Shingle and Ornament Co.....iii	<b>Sand Blast and Embossed Railroad Glass.</b> The Western Sand Blast Co.....iii	<b>Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Sash Lock.</b> Jenkins & Timby.....x The Champion Safety Lock Co.....x The Clafen Mfg. Co.....vii	<b>Saws.</b> Emerson, Smith & Co.....xiv Seneca Falls Mfg. Co.....ii	<b>Scroll Saws and Tools.</b> W. F. & J. Barnes Co.....ii Fred. A. Rich.....iv Seneca Falls Mfg. Co.....ii	<b>Shade Roller.</b> Cushman Bros. & Co.....ii	<b>Shaking Grate.</b> Woodcock & Co.....x	<b>Sheathing Lath.</b> I. G. Jenkins.....x	<b>Shingle Stains.</b> Sam'l Cabot.....xiv Dexter Bros.....i	<b>Shutter Worker.</b> F. B. Mallory.....iii	<b>Skylights.</b> G. Hayes.....iv	<b>Sliding Blinds.</b> Hartman & Durstine.....x Wm. Willer.....x	<b>Stable Fittings and Fixtures.</b> S. S. Bent & Son.....iv	<b>Stained Glass Substitute.</b> W. C. Young.....cover iii	<b>Stair Iron.</b> Manly & Cooper Mfg. Co.....iv	<b>Steam Hot Blast Apparatus.</b> B. F. Sturtevant.....ix	<b>Tiles.</b> Chas. B. Kline.....v	<b>Tools and Machinery for Oil Wells.</b> Oil Well Supply Co.....iii	<b>Tools and Foot Power Machinery.</b> C. E. Little.....ii Seneca Falls Mfg. Co.....ii	<b>Tower Ornaments, Finials, Etc.</b> Thos. W. Jones.....vii	<b>Underground Cable.</b> Standard Underground Cable Co.....i	<b>Valves and Fire Hydrants.</b> Gloucester Iron Works.....v Mason Regulator Co.....xi Mellert Foundry & Machine Co.....cover iii Pancoast & Rogers.....xi	<b>Varnish.</b> F. W. Devoe & Co.....i Standard Varnish Works.....iii	<b>Vault Lights.</b> Manly & Cooper Mfg. Co.....iv	<b>Ventilating and Exhaust Fans.</b> Geo. P. Clark.....iii	<b>Wall Plaster.</b> Adamant Mfg. Co.....vii	<b>Water Heaters.</b> Instantaneous Water Heater Co.....iv	<b>Water Pressure Regulators.</b> H. Mueller & Sons.....iv	<b>Weather Strips.</b> J. Dunfee & Co.....vii	<b>Weather Vanes.</b> Thos. W. Jones.....vi	<b>Window Guards and Gates.</b> Composite Iron Works.....cover ii	<b>Window Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Window Shadings.</b> Oswego Shade Cloth Co.....cover iv	<b>Wood Carpet.</b> J. Dunfee & Co.....vii	<b>Wood Finishes.</b> Bridgeport Wood Finishing Co.....ix F. W. Devoe & Co.....i Murphy & Co.....i D. Rosenberg & Sons.....iii	<b>Wood Mantels.</b> Keeler & Co.....xiii Francis D. Kramer.....xiii Mankey Decorative Co.....xii	<b>Woodworking Machinery.</b> F. H. Clement.....cover ii J. O. Colladay & Co.....xii Connell & Dengler.....xii The Egan Co.....xii E. & F. Gleason.....cover iv Hoyt & Brother Co.....xii C. B. Rogers & Co.....iv Samuel J. Shimer.....iv
--	--	---	--	---	--	---	---	--	--	--	---	--	--	--	--	--	---	--	--	---	--	--	--	--	---	--	---	--	--	---	---	---	---	---	--	-------------------------------------	--	--	---	---	--	--	--	--	---	---	--	--	---	--	--	---	---	--	--	--	---	---	---	---	--	---	---	--	---	--	---	--------------------------------------	--	---	---	---	--	---------------------------------------	---	--	---	--	--	---	---	---	---	---	---	--	--	--	--	---	---	--	--	--

# A VALUABLE BOOK

## ON PHYSICAL CULTURE

# FREE

## ON APPLICATION.

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

**NARRAGANSETT MACHINE CO.,**  
**55 Sprague Street, Providence, R. I.**

HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH  
CABOT'S CREOSOTE STAINS.



These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 50c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. Send for Samples on Wood, and Circulars.

SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.



The Thomson-Houston Electric Co.

—MANUFACTURE—

THE ONLY PERFECT AUTOMATIC SYSTEM OF

# ARC AND INCANDESCENT LIGHTING

In the World.

*New illustrated pamphlet will be furnished on application.*

THE THOMSON-HOUSTON ELECTRIC COMPANY,

Principal Offices: 178 Devonshire St., BOSTON.

Western Offices: Pullman Building, CHICAGO.



## PRINCE'S METALLIC PAINT

An Indestructible Coating for

Iron, Tin and Wood.

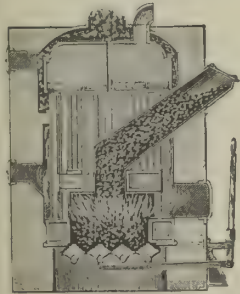
Will cover twice the surface at less than half the cost of lead.

But one color made, "Brown." Send for circular, to the sole manufacturers,

PRINCE MANUFACTURING CO.,

71 Maiden Lane, New York.

## The BRONSON Improved MAGAZINE Base-Burning STEAM HEATING BOILER.

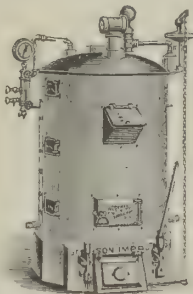


For Steam and Hot Water Heating. Automatic and Reliable. With Brick or Iron Settings, as you may prefer. The Bronson is constructed on scientific principles, the fire surface being of the best boiler tubing that can be obtained. This boiler exposes more water to the direct action of the fire, either in steam or hot water heating, than any boiler made. We are making a specialty of a High Grade All-steel Boiler, which we are anxious to place by the side of anything in the world for actual results. Reliable Agents Wanted. Send for Illustrated Catalogue and Price List.

WESTON ENGINE CO.,

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sole Agents, 40 Cortlandt Street, New York.



## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

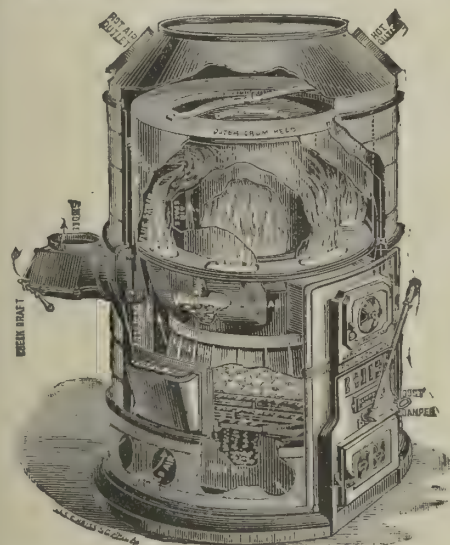
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



### SOMETHING NEW!

### Model Novelty Range.

Economy in Space, Fuel, and Labor.

No Brick Jambs or Lintel or Boiler Stand.

Horizontal Hot Water Boiler on Top of Range.

HOT AIR ATTACHMENT.

MANY OTHER FEATURES.

Architects, Builders, and Owners should see and call for the above Specialties for Dwellings or Apartment Houses.

ABRAM COX STOVE CO., PHILADELPHIA and CHICAGO,

EXPERTS AND SPECIALISTS IN HOT AIR AND RANGE SUPPLIES.

NEW YORK AGENCY:

WILKINSON & BANTA, 250 WATER STREET.



## ART STAINED GLASS

For Churches & Dwellings

Antique and Mosaic Work. Designs and Estimates on application.

William Reith,

134 N. 7th St., Philadelphia, Pa.



Cast Iron Pipe for Structural Work, Columns, etc.

Flange Pipe and Specials.

STOP VALVES, FIRE HYDRANTS, LAMP POSTS. MELLERT FOUNDRY & MACHINE CO., Limited, READING, PA.

## Art \* Metal Work

BRASS LAMPS FOR CHURCHES. BRASS WORK FOR CHURCH ALTARS. BRONZE GRILLES FOR DOORS. WINDOW RAILINGS. ORNAMENTAL LANTERNS. BRASS RAILINGS FOR BANKS. METAL SIGNS.

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

## STAINED GLASS

MEMORIAL, CHURCH, AND DOMESTIC WORK.

C. H. POSTEL & CO.,

Branch Office, 527 Arch Street.

1314 RIDGE AVE., PHILADELPHIA.



Manufacturer of Ecclesiastic and Domestic

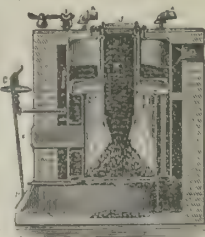
## ART STAINED GLASS,

F. J. RIESTER, Prop'r, Buffalo, N. Y.

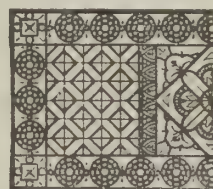
## The Dunning Patent Wrought Iron Boiler. (Over 13,500 in use.)



THE Dunning Boiler, Self-Feeding, is the best for Low Pressure Steam Heating, and insures a warm house night and day. Free from Carbonic Acid Gas and Smoke. Made in eleven sizes, suitable to heat the smallest Cottage to the Largest Business Block, in five different styles: As a Magazine Boiler, which requires attention but once in twenty-four hours. As a Surface Burning Boiler, which will burn Hard or Soft Coal, Wood, Coke or Gas. As a Hot Water Boiler, for Green House and hot water heating. As a Portable Boiler, to be set without brickwork. Also in Two Sections, to pass through any door or window, where whole one cannot enter. Steam Engines and Boilers of all kinds and machinery generally. Manufactured at the New York Central Iron Works, Geneva, N. Y., U.S.A. LOCK BOX 40. Send for New Illustrated Catalogue.



Beautiful & Lasting for ORNAMENTING WINDOWS, DOORS, TRANSOMS, &c.



## Stained Glass SUBSTITUTE

AT SMALL COST. Send for Illustrated Catalogue and Prices. Samples by mail 25 cents.

SOLE AGENT, 733 ARCH ST. W. C. YOUNG PHILADELPHIA, PA.

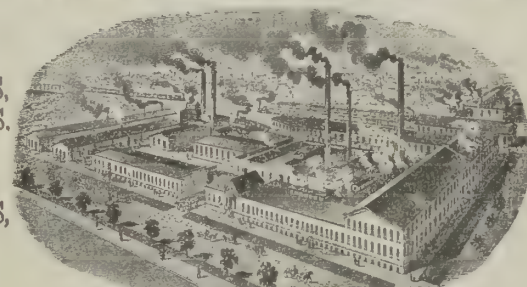
AGENTS WANTED EVERYWHERE.

## KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

### BUILDING PAPERS.

ROSIN SIZED and WATERPROOF SHEATHINGS, DEADENING FELTS, PLAIN and CORRUGATED CARPET LININGS, ASBESTOS SHEATHINGS, Etc.



2 and 3 PLY PREPARED ROOFING, TARRED ROOFING FELTS, ROOFING MATERIALS, Etc., Etc. Send for Samples and Prices.

ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.

H. F. WATSON, MFR., ERIE, PA.

CHICAGO, ILL., Office, 86 Washington St.

NASHVILLE ROOFING & PAVING CO., Nashville, Tenn.

LIBBY & WILLIAMS PAPER CO., St. Louis, Mo.

## Warren-Ehret Co.,

—MANUFACTURERS OF—

## ROOFING

OF ALL KINDS.

BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc. Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

—WORKS:—

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you get the quality and brand wanted?

Because every PERFECT SHEET of the following three extra fine guaranteed brands of Roofing TIN IS STAMPED at the works with the name of the brand and the thickness. Please note this.

"Old Style." Extra Heavily Coated. The Best Made.

"Westminster." Re-dipped. Made from Heavy Iron.

COCKLEY K Highest Grade of Heavy Regular Coated.

EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and full information given.

**N. & G. TAYLOR CO.**

Established 1810. 77th year.

**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



PHILADELPHIA,

423 Walnut Street.

ST. LOUIS,

113 North 8th Street.

CHICAGO,

50 Dearborn Street.

ANYBODY CAN PUT IT ON.

EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY

**M. EHRET, Jr., & CO.,**

**R. U. BUILDING** IF SO

Send for our Illustrated Book of



## FLORIDA HEATERS

16 Sizes for Steam.

15 Sizes for Hot Water.

WILL NEVER BUST OUT OR EXPLODE.

MANY THOUSANDS IN ACTUAL USE.  
Reputation Established.

No Experiment.

SPECIALLY ADAPTED TO WARMING

**SUBURBAN HOMES.**

Maximum of Heat from Minimum of Fuel.

Sectional, Compact. No brick work required. Easy to manage. Magazine or surface feed. No dust. No gas. Estimates given. Correspondence promptly answered. Address

**Pierce, Butler & Pierce Mfg. Co.,**  
SYRACUSE, N. Y.



## YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,

SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**THE P & B**

IDEAL ROOFING,

SHEATHING and INSULATING PAPERS.

Electrical Compound, Farmers', Brewers', and Preservative Paints.

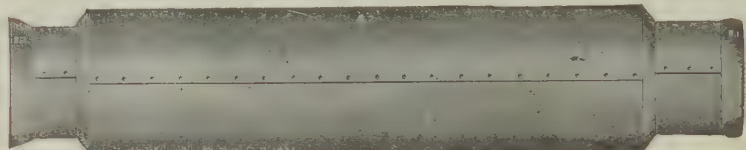
Please mention this paper



## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.



Pipe complete and ready for the trench.

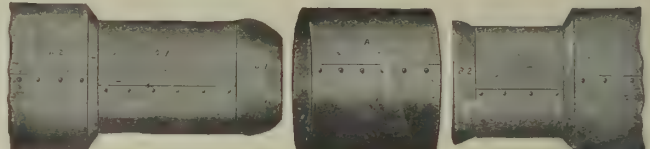
It is designed for

Public Works,

Public Buildings,

—AND—

Private Dwellings.



Wrought iron sleeve and the male and female ends before connecting for jointing.

MANUFACTURED BY THE

**PENNSYLVANIA PIPE MANUFACTURING CO.,**

Germantown Junction, Philadelphia, Pa.

## Architects, Roofers, Builders. "Alderly" & "Pennsyl" Old Method Roofing Plate

THE TWO BEST BRANDS OF GUARANTEED ROOFING PLATES. NO BETTER PLATES MADE.

"ALDERLY," Made of Siemens-Martin Soft Steel. Only Perfectly Square Plate. Perfectly Sorted.

"PENNSYL," OLD METHOD TREBLE COATED ROOFING PLATE. Guaranteed to Stand Any Test. Heaviest Coated.

SEND FOR SAMPLE BOXES OF THESE CELEBRATED ROOFING PLATES.

SOLE MANUFACTURERS of the "PATTEN" METALLIC ROOFING SHINGLES. BEST MADE.

**GUMMEY, SPERING & CO.,**

Philadelphia—Liverpool.

## STAINED GLASS

For Churches and Private Dwellings, etc.

**JEWELLED MOSAICS.**

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WOOD

## WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.

## WINDOW GLASS.

**Malaga Glass & Mfg. Co.,**

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

MALAGA AND MILLVILLE, N. J.

OFFICE,

400 CHESTNUT ST., PHILADELPHIA.



"GIANT" PORTLAND CEMENT,

"EGYPT" PORTLAND CEMENT,

"IMPROVED UNION" CEMENT,

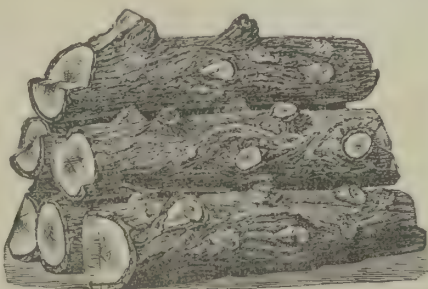
"UNION" CEMENT.

**LESLEY & TRINKLE, Sales Agents, 216 South Third St. Phila.**

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

Manufacturers,

1330 Chestnut St., Phila., Pa.

## SHAW & CEARY,

MANUFACTURERS & DEALERS

## ELECTRICAL APPLIANCES.

53 No. Seventh St.,

PHILADELPHIA.



In ordering your Window Shadings specify

**"CHOUAGUEN,"**

AND TAKE NO OTHER.

See Trade Mark.

Are the Best Finished, Most Uniform, and Most Durable Goods made.

ENQUIRE OF ANY DEALER.







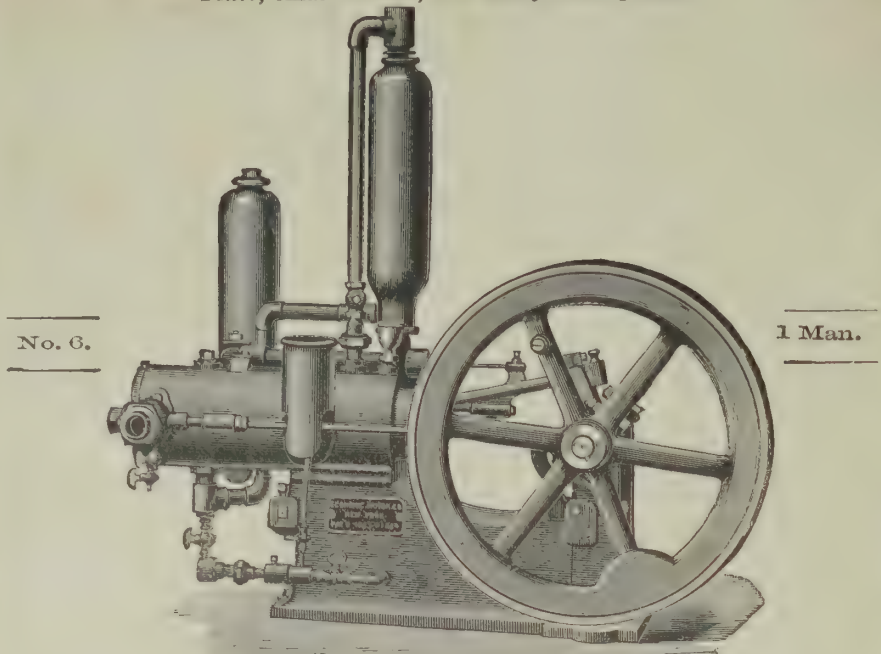


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra Insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

- No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.  
No. 8. One Horse, - 1,500 " " " "

## GASOLINE GAS ENGINES.

- No. 15. One Man, - 300 Gallons, 50 feet High, per Hour.  
No. 16. One-Half Horse, 600 " " " "  
No. 18. One Horse, - 1,500 " " " "

Four Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power. Our Gas Engines will work satisfactorily when attached to Gasoline Machines. SEND FOR ILLUSTRATED CATALOGUE.

**Economic Gas Engine Co.,**  
Office and Salesroom, 34 DEY ST., NEW YORK.



**IN OFFICE BUILDINGS,**  
with *U. S. Mail Chutes*, (pat'd), and the *U.S. free collection service*, tenants mail letters without going down stairs. Write for particulars. *The Cutler Mfg. Co., Rochester, N. Y.*, Sole Makers.

Are you building a new home? Make it beautiful.

**STAINED and LEADED GLASS.** For Public and Private Buildings. Send for Price List.

## BRAY'S PATENT GLASS MOSAIC

Is the handsomest, best and cheapest

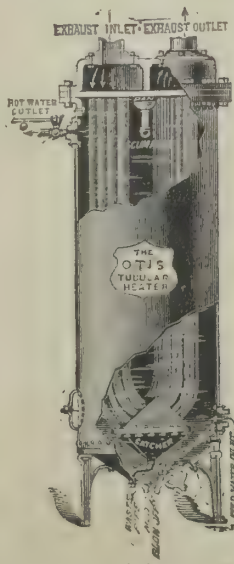
**STAINED GLASS!**

and far superior to ordinary leaded glass for Door Panels, Transoms, Fire Screens, Hall Lanterns, and all the uses of modern **Glass Work.**

Illustrated Catalogue on application. | Beacon Stained Glass Works, 35 & 37 Province St., Boston, Mass.

Are you erecting a new church? Have it attractive.

## THE OTIS TUBULAR FEED WATER HEATER



With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of

## ELEVATOR PUMPS,

both Passenger and Freight, to heat the Feed Water for the boilers.

We guarantee one square foot of heating surface per horse power. We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.

MANUFACTURED BY  
**Stewart Heater Company,**  
40 & 42 Clinton Street,  
BUFFALO, N. Y.

## COMPOSITE IRON WORKS CO.

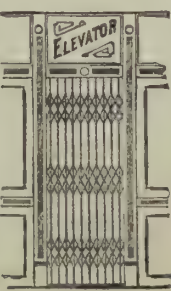
83 Reade Street, New York.

Established 1847.

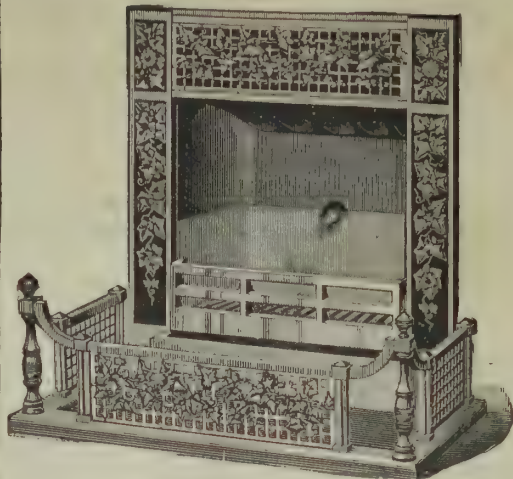
## Artistic Iron Work -FOR- BUILDINGS.



Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



# THE JACKSON Ventilating Grate & Fireplace Furnace



HEATING ON ONE OR TWO FLOORS  
300 DIFFERENT STYLES.

## NINETY

of these Grates ordered for the New Court House at St. Paul, Minn.

## SIXTY

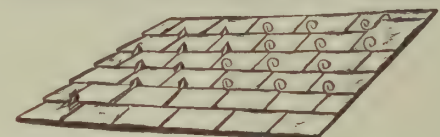
in use in Columbia College, New York.

Send for Catalogue F.

**EDWIN A. JACKSON & BRO., 50 Beekman St., New York.**

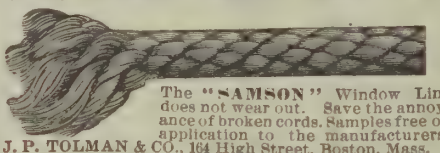
**ARCHITECTS, BUILDERS!**  
**ATTENTION IS CALLED TO**  
**ADVERTISEMENT ON PAGE III**  
**FRANK B. MALLORY.**

SPECIFICATIONS SHOULD INCLUDE  
**Folsom's Patent Roof Snow-Guards**



Address, —300,000 IN USE.—  
**JOHN H. HILLER, 1408 Tremont St., Boston.**

## Solid Braided Cotton Sash Cord.



The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers.  
**J. P. TOLMAN & CO., 164 High Street, Boston, Mass.**



THESE are in every respect strictly first-class Paints, composed of pure linseed oil and the highest grade of pigments. They are prepared ready for the brush, in 54 newest shades and standard colors, and, on account of their purity and great covering properties, we offer them as the most DURABLE and ECONOMICAL Paints ever produced. One gallon will cover from 250 to 275 sq. ft., two coats.

Samples and Descriptive Price List free by mail.  
**H. W. JOHNS MANUFACTURING COMPANY,**  
SOLE MANUFACTURERS OF  
H. W. Johns' Colors in Oil, Liquid Coach Black, Asbestos Roofing, Fire-Proof Paints, Building Felt, Steam-Pipe and Boiler Coverings, etc. Vulcabeston Piston Rod Packing Rings, Gaskets, etc.  
**87 MAIDEN LANE, NEW YORK.**  
Chicago, Philadelphia, London.

# SCHUMACHER & ETTLINGER, LITHOGRAPHERS,

32, 34 and 36 Bleecker and 311 Mott Streets,  
**NEW YORK.**

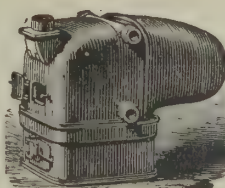
FINE COLOR WORK A SPECIALTY.

# Dwelling-Warming Hot-Water System.

**HITCHINGS & CO.,**  
233 MERCER STREET, N. Y.

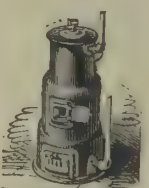
—ALSO—

# Greenhouse Heating and Ventilating Apparatus.



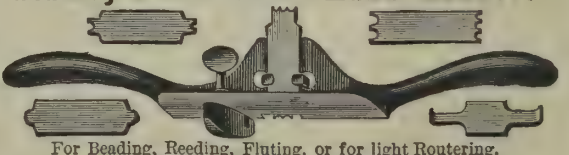
Estimates of cost furnished on application.

SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.

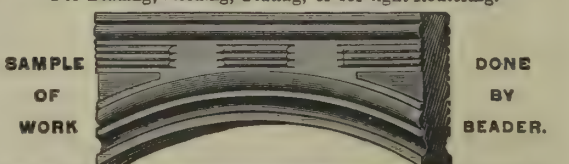


IMPROVED  
Labor-Saving  
**CARPENTERS' TOOLS.**  
**STANLEY**  
RULE & LEVEL CO.  
New Britain, Conn.  
SOLD BY ALL  
Hardware Dealers.

## Stanley's Universal Hand Bearer.



For Beading, Reeding, Fluting, or for light Routering.



No. 66. Iron Stock, with seven Steel Cutters. \$1 00



Page 29

# SCIENTIFIC AMERICAN

Entered at the Post Office of

AND BUILDERS

New York as Second Class Matter.

ARCHITECTS

NEW YORK, AUGUST, 1888.

EDITION.

Vol. VI. Subscription, \$2.50 a Year.

Single Copies, 25 Cents. No. 2.



A RESIDENCE AT BLACK ROCK, CONN.

[For description see page 24.]



# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

NEW YORK, AUGUST, 1888.

THE

## Scientific American,

ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

**Bound Volumes.**—Two volumes are published annually. Volumes 1, 2, 3, and 4, which include all the numbers of this work from commencement to close of 1887, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,  
361 BROADWAY, NEW YORK.

For additional information concerning any of the plans or buildings illustrated in these pages, address MUNN & Co., as above.

### CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN & Co., Publishers, 361 Broadway, New York.

### CONTENTS

Of the August number of the ARCHITECTS AND BUILDERS EDITION of SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

Baskets, hanging.....	28	Mason Regulator Co.....	44
Belheda, pool of.....	43	Mortar.....	44
Bird, humming.....	37	"Odd jobs," Stanley's.....	44
Blinds.....	29	Paper, wall, and carpets, poison-	44
Block, city.....	25	ous.....	34
Ceiling, new, N. Y. State Capitol.....	33	Pfeiffer, Carl.....	43
Cement, Portland, testing.....	34	Pines, large, transplanting.....	33
Church at Beckenham, Kent.....	41	Plumbers, examination questions	43
Cottage, \$300.....	30	for.....	43
Cottage, seaside.....	31	Poplar, Ohio's largest.....	42
Cottages, Queen Anne, two.....	27	Quinces, how to grow.....	32
Creosote wood stains.....	24	Residence, \$2,800.....	29
Dwelling at Glenridge, N. J.....	44	Residence at Black Rock, Conn.....	23, 24, 26
Fires, Fourth of July.....	24	Residences, some New England.....	42
Glue, liquid fish.....	44	Road improvement.....	43
Glue, vegetable.....	24	Rust in water pipes.....	26
Heating, house, by hot water cir-	44	School houses, architectural.....	28
ulation.....	44	Shingles, the "Patten".....	43
Hemp, Manila, in plaster.....	39	South, manufacturing progress.....	31
House, \$2,000.....	28	Stables at Syracuse, N. Y.....	37
House, carriage, barn, etc.....	38	Stream, power, to estimate.....	31
House, double, \$1,500.....	32	Strelinger & Co.....	44
House, double, \$4,200.....	39, 40	Tulip and other trees.....	26
House, fire engine, of moderate	34	Villa at Aulnay-les-Bondy.....	33
cost.....	24, 34, 35	Water closet, slag.....	25
House, hen, perfect.....	41	Wells, artesian, Galveston.....	33
Interiors, decorative materials	30	Wheats, mixed.....	32
for.....	30	Wheels, irrigating.....	44
Joists of elliptical vault.....	26		

### A DWELLING AT GLENRIDGE, N. J.

One of our colored plates this month illustrates a comfortable dwelling at Glenridge, of which the details, drawn to scale, are given on page 36, and the floor plans on page 25.

This house has a front of 47' 8", not including piazza; side, 30' 4", not including piazza. For size of rooms see floor plans. Height of cellar, 7'; first story, 10' 9"; second story, 9' 3"; attic, 8'.

The foundation is of quarry stone; first story to top of windows, clapboards; second story, California red-wood shingles; roof, black slate.

There are open fireplaces in dining room, reception room, and parlor; back stairs from basement to attic; attic has four finished rooms. Direct access from main hall to other rooms. Cost, \$8,500, plumbing and hot air furnace included.

### A FIRE ENGINE HOUSE OF MODERATE COST.

One of our colored plates this month illustrates a fire engine house for which, and the following description, we are indebted to the *Fire Record*, of this city. The house is adapted for many of the small towns and villages throughout the country, and will be found suitable for an engine, hook and ladder, hose, or chemical company.

The design as shown is for a building 20 feet in width by 40 feet in depth, two stories in height, ground excavated under entire building. The dimensions as given may of course be varied materially to suit individual wants. For instance, there may be a demand for a building to accommodate a hook and ladder truck. The sitting room on first floor in this case could be dispensed with without in any manner affecting any of the other general arrangements. Again, if it was desired to afford accommodations for hook and ladder truck and engine side by side, the additional width can readily be secured without disturbing any other feature. In some cases the upper floor may have to be left unfinished, or it may be necessary to devote the entire floor to sleeping accommodations, the library in that case being used as the officers' quarters, and has a desk and folding bed, or again, where a steam fire engine is used, it may be deemed advisable to devote the rear portion on first floor to stable purposes. A variety of instances for individual uses will undoubtedly present themselves to our readers, and we might say here that the architects would be glad to correspond with any parties seriously considering the erection of a fire building, and will be pleased to give them further information when desired.

In the general arrangement as given, on the first floor is the apparatus room, having closets, desk, and two wash basins, and in the rear of it a sitting or meeting room connected by sliding doors, cut glass panels with representations of emblems of the fire department.

In front of building is the hose-drying tower, entered by door from the street, making it unnecessary to drag the wet and dirty hose into the engine house—the hose being raised to top of tower by firemen standing in the street. In addition to the large double doors in front is a small door connecting with vestibule, from which there is an entrance to the apparatus room and also to the second story.

The second story consists of a parlor or billiard room, library, and bath room, etc., all well lighted.

Extending above the roof is a bell tower, so arranged as to give out the full tone of the bell when struck. The balcony in front, with gable finish above, crowned by a flag staff, adds much to the handsome appearance of the front.

The basement has a kitchen and workshop in the rear and a cellar in front.

Floors throughout laid with first quality 1½ inch thick mill-worked white pine floor plank, and over 5 inches wide, laid with close joints.

Interior door and window architraves to be 5 inches wide, of moulded plaster, finished with base and corner blocks.

Building complete as shown will cost about two thousand dollars; if without tower, two hundred dollars less; and if of only one story, about one thousand dollars.

Details drawn to scale are given on page 35, and the floor plans on page 34.

### A RESIDENCE AT BLACK ROCK, CONN.

We give illustrations of the residence of Mr. James Horan, Black Rock, Conn., the perspective view on page 23 and the floor plans on page 26.

The grounds are beautifully laid out and adorned with large beds of flowers, shrubbery and trees, presenting a picturesque appearance.

This house presents an attractive exterior and is elegantly finished within.

Foundation is of stone, with underpinning of cut blue-stone, neatly pointed in black mortar.

The exterior is covered with clapboards and shingles intermingled.

The roof is covered with Bangor slates, octagonal cut.

One of the features of this house is its large hall, with grand staircase.

The staircase is of ash, with turned posts and newel finished in the natural wood. The risers and treads of ash.

Opening on this staircase is a very handsome cut glass window.

There are sliding doors between the hall and the principal rooms on first floor.

There is a parlor, sitting room, dining room, kitchen, and back hall, and large pantry, all fitted up in the best manner.

On the second floor there are four spacious and well lighted bedrooms, smoking den, which can be used for an office or sewing room; bath room, and linen closet, also rooms finished in attic, and ample storage room.

The trim throughout is of whitewood and brown ash.

The door and window casings are beaded and corner blocks are at angles, etc.

The parlor and sitting room have open fireplaces, with tile hearths—large enough for wood fires.

Hardwood mantels, with glass mirror, etc. Dining room and front chamber have neat hardwood mantels.

The ceilings are neatly corniced and paneled, with hardwood center piece.

The house is piped for gas and provided with handsome ornamental chandeliers.

There is a side porch, with entrance to sitting room. The drive goes close to the steps of this porch.

The house is heated by the hot water system.

The plumbing is of the best. Hot and cold water throughout.

This dwelling cost the owner \$6,000 to build, but if one wished to erect a house like it, and maintain the exterior, but reduce the cost of the interior finish, it could be built for \$4,800, complete.

Our engraving was made direct from a photograph of the building taken especially for the SCIENTIFIC AMERICAN.

### Vegetable Glue.

Concentrated solution of gum arabic possesses the disagreeable property, when applied to printing and other paper not strongly sized, of penetrating them to transparency, yet, in spite of this, not making them adhere to other paper. Paper cannot be attached to common pasteboard, nor wood to wood by it. Paper gummed with mucilage will not adhere to metallic surfaces, but soon falls off, and it is of no use for glass, porcelain, or earthenware. All these disadvantages are remedied when an aqueous solution of sulphate of aluminum is added. For 250 grains of the concentrated gum solution (prepared with two parts of gum and five of water), two grains of cryst. aluminum sulphate will suffice. This salt is dissolved in ten times its quantity of water, and mixed directly with the mucilage, which in this condition may be termed vegetable glue. Solution of alum serves the same purpose, but far less efficiently.—*Pharm. Central*.

### Fourth of July Fires.

Fifty-two actual fires occurred in New York City on the glorious Fourth just past. Most of these were, by quick work on the part of the fire department, confined to the awnings in which they had been started by fire-crackers and fireworks, and in the majority of cases the damages were trifling. While this record is, however, cheering in comparison with that of last year, which showed ninety-four fires, it still indicates very plainly the danger to which the city is annually subjected by our peculiar and senseless method of celebrating the day. Undoubtedly the restrictions upon the sale of fireworks this year by making them less readily available have had the effect of reducing the number of fires during the week or two preceding the Fourth, as well as on that day, but until the police set about enforcing the laws forbidding their use in the city, there can be no real freedom from the peril. As it is, these laws and ordinances are simply dead letters. For two years in succession the superintendent of police has announced his intention of seeing them obeyed, yet all over the city, "from morn till dewy eve," pistols, firecrackers big and little, and toy cannon cracked and banged, while after nightfall rockets and Roman candles hissing and popping from sidewalk and window added to the horrid row.

Burning paper and sparks in showers fell and blew everywhere, and policemen looked benevolently on or turned their backs, or perhaps now and then, when a particularly big crowd of small boys had gathered to celebrate, sauntered in and gently dispersed them. It may be urged that in so large a city as New York, with its hordes of juvenile patriots all on powder burning bent, it would be simply impracticable for the police to put a stop to the evil; but it has never been tried, and we fancy that were a reasonable number of officers in plain clothing detailed in each precinct to watch for offenders and promptly lock them up in the station house for a subsequent lecture by the magistrate, the effect would be most wholesome, and that if this were persisted in for a few years the present dangerous custom would die a natural death.—*Fire and Water*.



DESIGN FOR BLOCK OF N.Y. CITY.  
CHARLES T. MOTT, ARCHT.



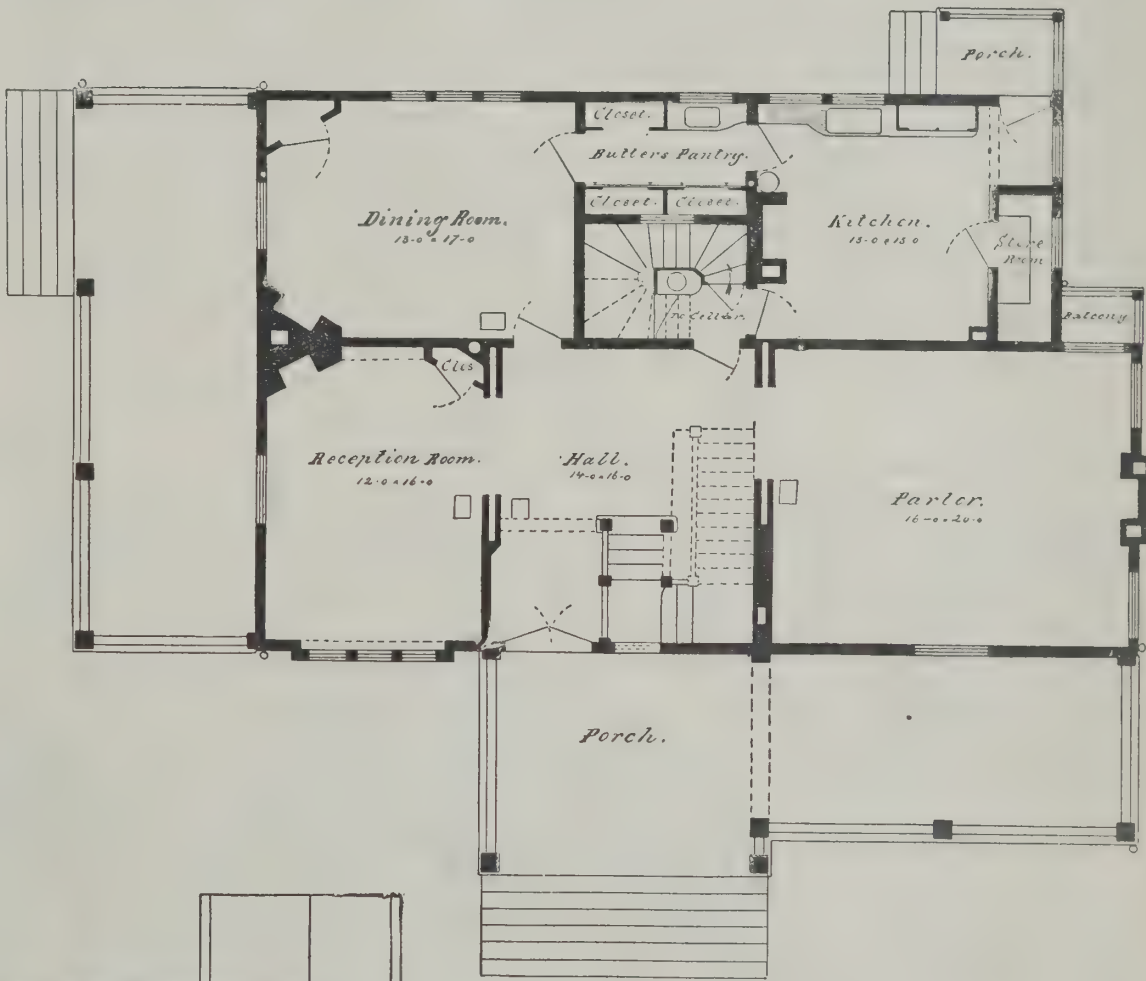
AN UPTOWN BLOCK OF RESIDENCES, NEW YORK.

A CITY BLOCK.

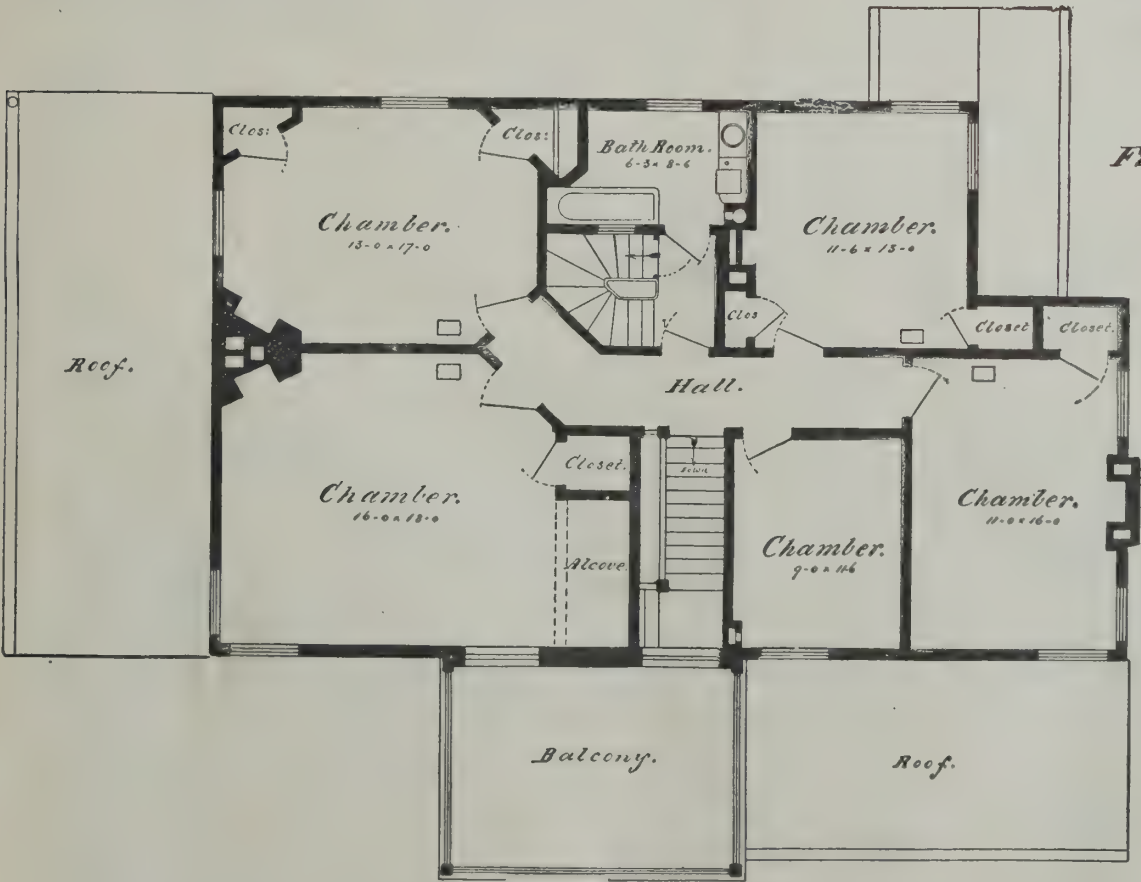
We give a sketch from a design by Charles T. Mott, architect, of this city. There is a richness of appearance and excellence of proportion in these buildings which render them very attractive, and reflect credit upon the architect.

The Slag Water Closet.

Among the many materials that have been suggested and used from time to time for the purpose of absorbing and deodorizing fecal matter, not one, perhaps, is so interesting to those engaged in sanitary science as the one whose properties were demonstrated at a meeting lately held in St. Stephen's Hall, inasmuch as the material used—viz., common slag—has puzzled for a long time many a practical chemist and engineer to know to what purpose it may with profit be applied. We remember hearing, however, some months back, of the application of crushed slag as a dressing in agriculture for heavy, clayey soils. It is said to be extremely porous, rendering the soil more absorbent, and is also of manurial value, on account of the notable quantity of phosphoric acid it contains. This most important subject of dealing with the sewage of our towns has been so much discussed, and is so well worn, that to point out the advantages or disadvantages of the dry earth system over that of the water carriage system were superfluous. Suffice it to say, the inventors of this new material for the defecation of sewage matter (Messrs. McGregor and McArthur, of Dundee) take for granted that the advantages of the former system, at least in many cases, are unquestionable. They further claim for it the following additional advantages: (1) the



First Story Plan.



Second Story.

A DWELLING AT GLENRIDGE, N. J.  
[See colored plate; also details, page 36.]

cheapness of the material, the cost being roughly estimated to be from 5s. to 10s. per ton, including crushing and carriage; (2) its supply being practically inexhaustible; (3) its porous property, which, independent of (4) its manurial qualities, renders it valuable to clayey soil. Dr Redwood gives the following analysis of the material after use:

	Per cent.
Fixed inorganic matter, after ignition.....	71.68
Insol. silicious matter.....	60.50
Lime.....	2.85
Phosphoric acid.....	2.31
Organic matter, with ammonia and water.....	28.32
Ammonia, ready formed.....	0.08
Organic nitrogen.....	0.13
Equal to ammonia.....	0.15

A sample was exhibited which had been in use five weeks ago, in which we failed to detect the slightest smell. The method of using it is similar to that adopted in the other earth closets. The pan is first charged with a certain quantity of the crushed slag, and after use another quantity is put in, the total quantity necessary, according to the inventor, being a third less than ordinary dry earth—that is to say, six persons would require one-third of a hundredweight of defecating matter per week. These claims are so strong that a careful trial of this method, and, indeed, of any new method which aims at the healthy as well as useful disposal of so great a nuisance from our midst, is well worthy the consideration of every sanitarian.—*Lancet*.



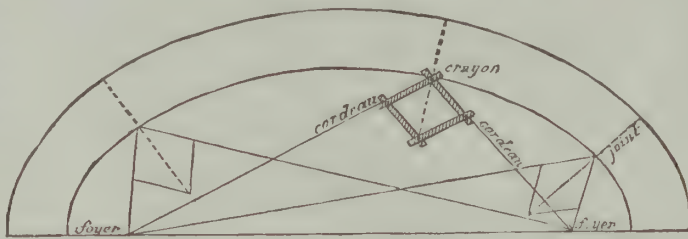
Rust in Water Pipes.

A correspondent of one of our English contemporaries describes a difficulty he has experienced in using iron pipes for conveying water, due to the formation of rust, and suggests an explanation which is novel, if not altogether plausible. The writer had formerly used  $\frac{3}{4}$  inch wrought iron pipes to convey water to his house from a spring 2,000 yards distant. There was a stand pipe near the house, up to which point the wrought iron pipe was but half full of water, and consequently corroded rapidly, so that in ten years' time it had to be replaced. The new pipes were of cast iron, 2 inches in diameter, and protected with coal tar in a way specially adapted for giving an enduring coating to water pipes. Notwithstanding this precaution, the correspondent states that during the summer months the water drawn from the pipe was found to be highly charged with iron in solution. At the conclusion of his note he puts the following question: "As the lead caulking was in every joint driven in so far as to be in actual contact with the water, does not this cause a galvanic action, and may not these 1,000 joints be 1,000 batteries?" Of this the *Metal Worker* says: "We cannot place much confidence in such an explanation, for lead and iron exert a very weak electrical action when arranged as a battery; and, furthermore, it is the lead and not the iron that corrodes—at least such is the information supplied by the text books. On the other hand, there are curious instances of the rusting of iron when in contact with lead, which would lend color to the statement that the presence of lead increases rather than retards the corrosion of the iron. An example of this sometimes noticed is the destruction of iron uprights fastened with lead into stone sockets. We have a case in mind where the posts of an iron fence around a city park became reduced near the base almost to a thread through the corrosion of the metal. That the adjacent lead caused the rapid corrosion does not seem reasonable, and yet the fact remains that at the ground, where the lead was, the posts were nearly rusted through, though the rest of the fence, even in spots where the water would collect

and remain, was not seriously corroded. Apart, however, from the relative action of lead and iron, it is only in the most exceptional cases that cast iron water pipes would be caulked in such a way that the lead would protrude through the joints."

LAYING OUT THE JOINTS OF AN ELLIPTICAL VAULT.

In the *Genie Civil* there is given a method of drawing a diagram of an elliptical curve. The process is very accurate, but has the inconvenience of necessitating an operation for each voussoir. Please permit me to point out to you the particular process that I have employed,



and which is just as accurate, and very simple and rapid. If you judge proper, you can make it known to your readers. Considering that the most perfect elliptical curve is that described by a string starting from the foci of the ellipse, I draw the profiles of the extrados and intrados. Having divided the latter into equal parts, I construct a lozenge formed of four thin rulers of equal length, which I join by movable rivets forming an eyelet on one side. The string serving to draw the ellipse having been passed through three of these eyelets, I draw the curve that I desire with a pencil placed against the central eyelet and, whatever be the point at which I stop, I constantly obtain the bisectrix of the angle formed by the two sides of the string, in taking the large diagonal of the lozenge formed by the four rulers. This diagonal elongates or shortens according to the angle formed by the two sides of the string. The accompanying sketch will allow me to dispense with any theoretical demonstration to prove the accuracy of the method, which is

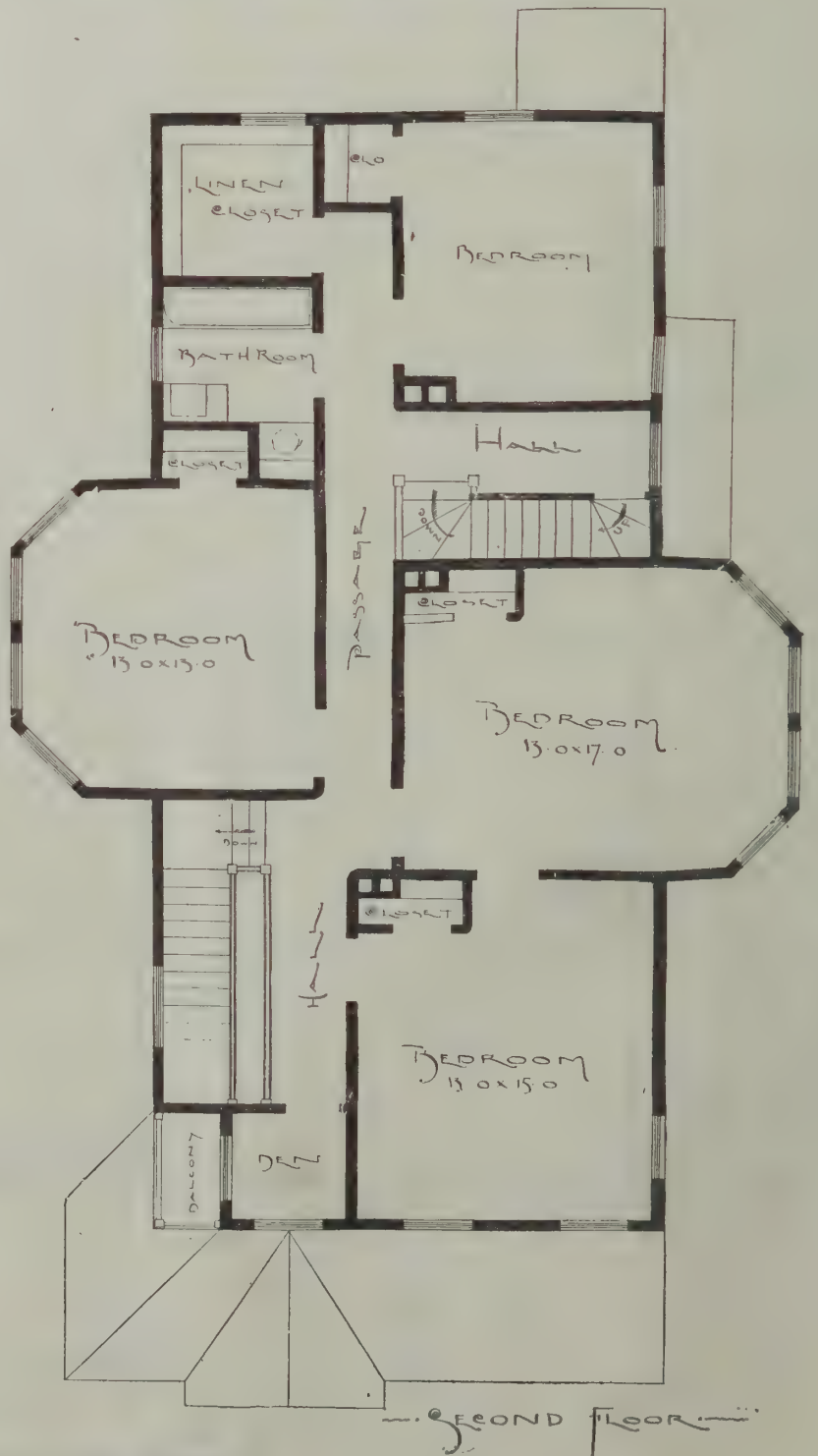
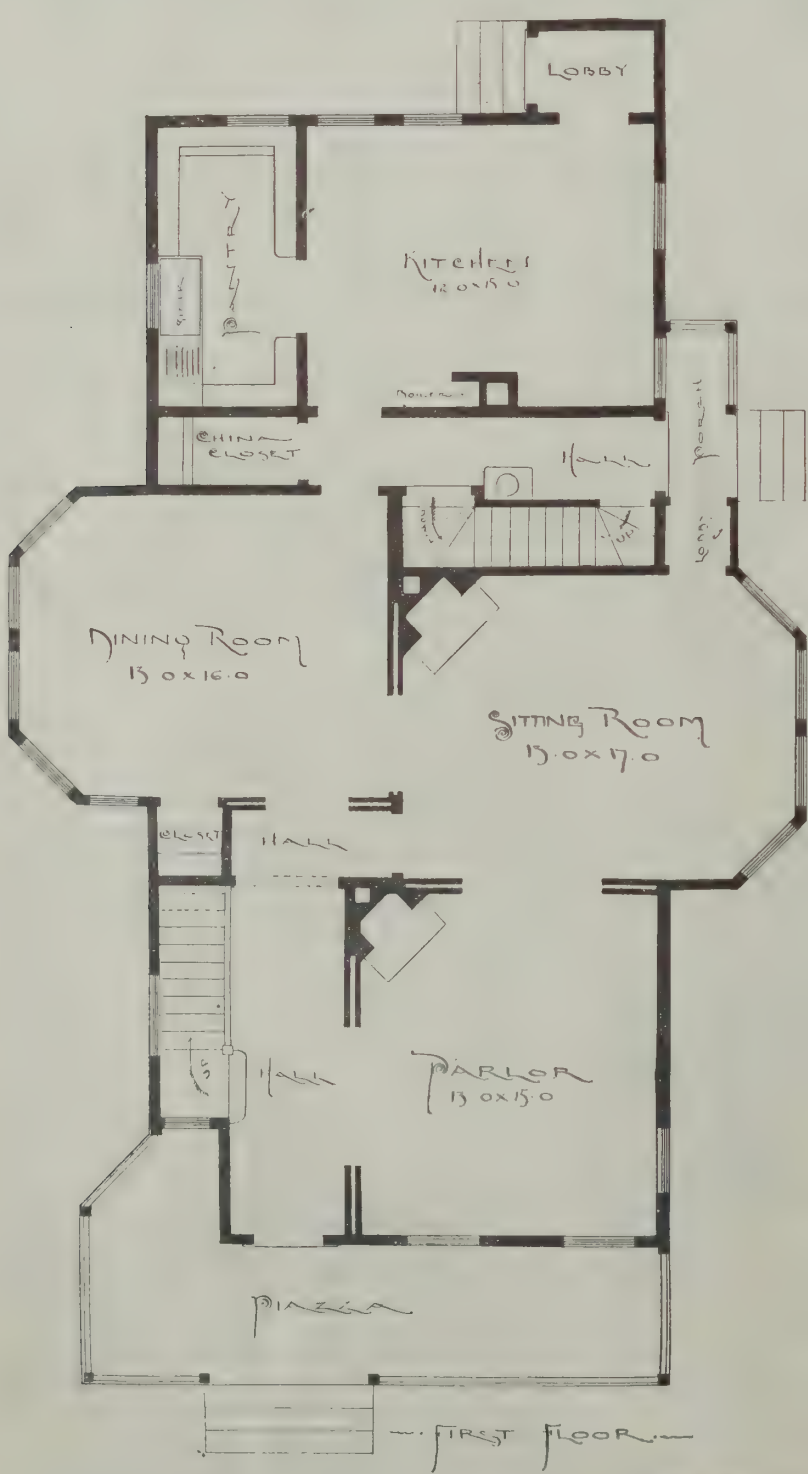
especially applicable for the surbased vaults of bridges. —H. Deyris, in *La Construction Moderne*.

The Tulip and Other Trees.

At the Cincinnati Exposition the American Forestry Congress exhibits a section of a tulip tree with a chronological table of its history, showing that the tree began its life when Queen Elizabeth came to the throne in 1558, was a stout sapling when Saint Augustine was founded, and gave respectable shade when the pilgrim fathers landed in New England. When La Salle saw it on the banks of the Mississippi in 1682, it had become a tree of royal stature; when the United States began to exist as an independent nation, it was four feet in diameter; and when cut for the Cincinnati Exposition, it had added another foot to its diameter, being five feet in 330 years. The Forestry Congress also exhibits a chart with many instructive illustrations of the present condition of our forest interests, both State and national. The division of forestry of the department of agriculture exhibits at the same place a collection of forest seeds; sections of 100 of our most important forest trees; 200 volumes on the subject of forestry in different languages, showing that there is such a literature; thirty-six heliotype pictures illustrating the effects of deforestation and the mode of reforestation. In the French Alps; and a collection of tools used in European forest planting and management.

THE Hooker School, Springfield, J. D. Stratton, principal, is the most beautiful vine-covered school building in America. The woodbine, Japanese ivy, wisteria, and trumpet vine literally cover the front of the building and three sides of the tower, the windows and doors only being kept clear.

It takes nerve to spend time and money to set trees and shrubs about the house, put a neat fence around the yard, and paint the farm buildings, but it makes home more beautiful, the family happier, and greatly enhances values.—*The Farmer*.



A RESIDENCE AT BLACK ROCK, CONN.

[For description see page 24.]



TWO QUEEN ANNE  
COTTAGES.

We give a perspective and floor plans of two Queen Anne cottages, lately completed for C. H. Hennings, Esq., at Bath Beach, Long Island.

These houses have a very pleasing elevation and well arranged plans, and contain all the modern improvements and conveniences.

The first story is clapboarded, the second story and gables are shingled.

The roof is shingled and painted an Indian red, to correspond with the rest of the house, which is painted in a similar color.

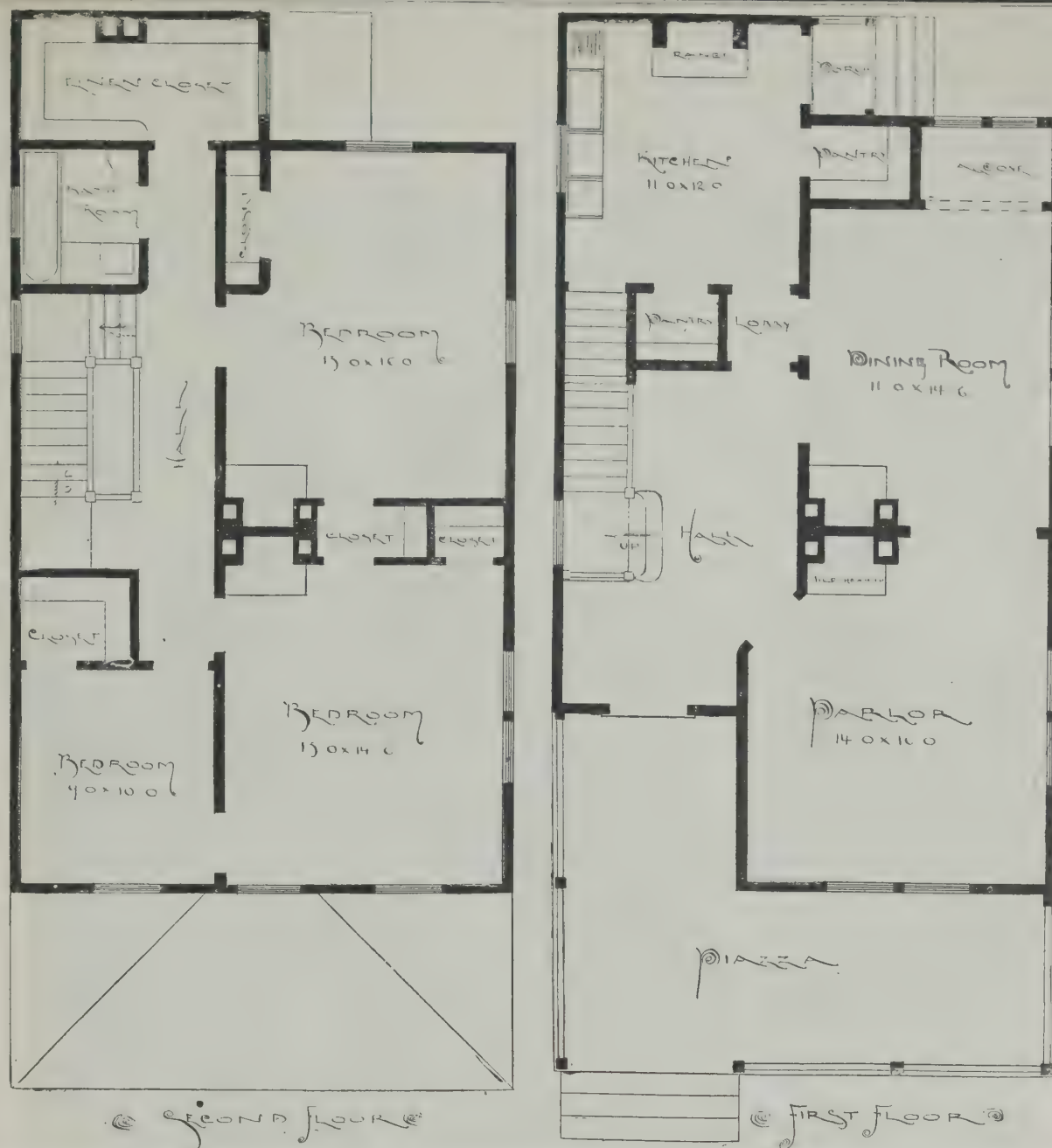
There is a cellar under whole of the house which is cemented and contains coal and wood cellars, furnace room, etc.

The foundations are of stone and brick.

On the first floor there is a large hall with parlor, dining room, and kitchen, three large bedrooms and bath room on second floor, two rooms in attic, besides ample room for storage.

The kitchen is fitted up with range, sink, wash trays, hot and cold water.

There is no plastering in these houses; the



walls are ceiled up with narrow beaded brown ash ceiling, laid in panels, all of which is highly polished, giving a very pleasing effect.

There are four open fireplaces, which have tile hearths, laid in a tasty manner, also hard wood mantels made to correspond with the finish in each room.

The trim throughout is of brown ash, and the door and window casings are beaded, and corner blocks are used at angles, etc.

In the hall there is a very handsome antique staircase of cherry wood, with numerous landings, etc. There is a cut glass window on staircase.

These houses cost \$4,000 apiece, completed ready for occupancy, but by having them plastered instead of ceiling with hardwood, with a good substantial trim inside, they could easily be built for \$3,000 apiece.

Our engraving was made direct from a photograph of the houses specially taken for the SCIENTIFIC AMERICAN.

The largest trees in the world are the Sequoia gigantea, on the western slopes of the Sierra Nevada. Some are over 30 ft. in diameter and 350 ft. high.



TWO QUEEN ANNE COTTAGES.



A \$2,000 HOUSE.

This design was lately built for Dr. Ferris, on Colorado Avenue, Bridgeport, Conn., and shows a lobby, three large rooms, and alcove on first floor and three large bedrooms on second floor.

First you enter the cottage over a cozy little porch, into a lobby which leads to parlor and dining room and staircase to second floor.

In the parlor there is an open fireplace with tile hearth and a very handsome hardwood mantel.

The dining room has a mantel of terra cotta; a shelf is provided of the same material.

The kitchen is large and fitted up in the best manner. Hot and cold water throughout. The trim is of whitewood, the door and window casings being band moulded.

The kitchen and bath room are wainscoted. The ceilings are neatly corniced and center pieces are provided. The house is piped for gas. There is a cellar under whole of house, and a portable furnace.

It is the intention to use portieres between the principal rooms on first floor.

The house is complete in every respect, and cost \$2,500 to build, but by having a plainer inside trim, it could be easily built for \$2,000.

Our engraving was made direct from a photograph of the house taken specially for the SCIENTIFIC AMERICAN.

Architectural School-Houses.

School-house architecture has of late received a share

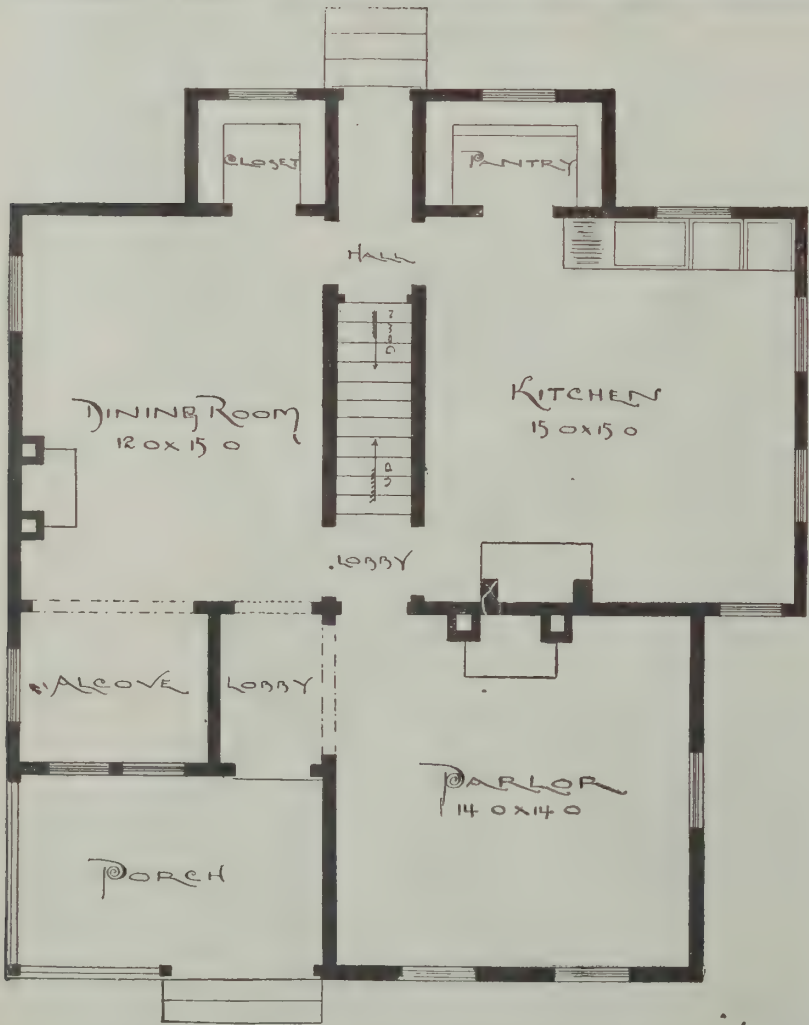
women into the smallest space, is past. If children suffer in the modern school-house, it is not from preventable physical causes. It is from over-study or congenial branches of learning forced upon them, or unsalutary home surroundings. Just now, when the interior has received its share of modernization, is a

tion, and its author should be condemned to confront examples of his monstrosities for the rest of his natural life. What is pleaded for is that classical models be taken for the modern school-house. The following out of correct principles can cost no more than the wretchedly "pretty" buildings one sees on every hand. Among

the advantages, apart from the mere æsthetic one of having public buildings models of correct style and taste, may be mentioned that of the instructive value to the little inhabitants of the building of the daily contemplation of an example of a leading type of architecture, about which the teacher is, perhaps, in vain trying to imbue the innocents with an abstract idea. The different leading elements of typical architectural structure might be also carefully preserved and made clearly distinguishable on the design which could be reproduced in perspective and elevation on the interior walls. As an object lesson in the rudiments of architecture, a classically constructed school-house would be of great value.—*Sanitary News.*

Hanging Baskets.

One of the prettiest hanging baskets I ever saw was made by rolling a big bunch of Sphagnum into a ball. It was then wrapped with fine copper wire, one end of which was left long to hang it by. By means of sharp-pointed sticks, cuttings of *Tradescantia zebrina* were inserted all over the ball. It was well soaked with water, and



FIRST FLOOR. — RESIDENCE AT MODERATE COST. — SECOND FLOOR.

A \$2,000 HOUSE.

of the attention which is its just due. The lighting, heating, ventilation, and sanitation generally of most modern city educational buildings leaves little to be desired. The era of the barn school-house, hot in summer and cold in winter, with the light coming in just where it could get a chance to, and the seats arranged so as to crowd the largest number of coming men and

good time to glance at the exterior of the structure. What does it most resemble? There are two types that have met and offended the writer's eye, the Saratoga trunk and the wedding cake varieties, one a mere box and the other ornate with gingerbread ornamentation. The first may be justified on the ground of the necessity for economy, the last by no considera-

hung in a shaded greenhouse. In a few weeks the ball was entirely hidden, and the effect was very pretty.—*American Garden.*

GEORGE W. VANDERBILT will stock the fine library building which he has just given New York City with \$100,000 worth of books.



precision, and for neatness and cleanness surpass the work of the plasterer. The heavier kinds of decoration for ceilings and walls are generally of *carton pierre*, a stone-like composition well known to our readers. The moulds are prepared in plaster, which can be taken to pieces in the usual way. These moulds are then filled up solid, or more generally only lined with the *carton pierre* in a state of pulp. When tolerably dry, the mould is removed, and the material is subjected to heat in a drying room until it is quite hard.

Nearly all the ornamental ceilings of our modern buildings and the decorations of private residences of a superior class are of one or the other of these compositions. For ceiling and walls in which the same pattern is repeated, plaster is no doubt the cheapest; but where elaborately ribbed and paneled surfaces and relief ornament is intended, there is no doubt a considerable advantage in using *papier mache* or fibrous plaster, cast in slabs that can be screwed up to the wood joists or wall battens. All dropping of plaster is avoided, and the work can be put up without injury to the joinery. Some years ago Messrs. Jackson, we believe, constructed a ceiling of this kind for the late Marquis of Westminster at Grosvenor House. It was for a large room, independent of the walls, the whole ceiling being fixed to a wooden core or cradle, which could be raised or lowered some feet by machinery, to suit the condition of the room for sound.

The architectural advantage of this mode of construction is that the ceiling can be made hollow, light, and sonorous; further, that the most intricate design or ribwork can be formed, admitting of a decorative effect by the use of color. The use of fibrous plaster, or ordinary plaster cast thin, with canvas as a backing, is now very extensively used where lightness and speedy execution are required. We now see the most elaborately designed ceilings reproduced in this manner, which it would have been impossible to execute in the old fashioned manner, in real plaster or in wooden ribs, at anything like the cost or expedition.—*Building News*.

#### A SEASIDE COTTAGE.

This residence has been lately erected on the main avenue at Bath Beach, Long Island, for Mr. Austin, of New York.

The situation commands a wide view of the surrounding country and also of the ocean.

Our engraving was made direct from a photograph of the house, taken specially for the *SCIENTIFIC AMERICAN*. The house is built substantially, with a view to use either as a summer or winter residence. It is heated by the hot water system.

The foundation of stone, with underpinning of brick, first and second story clapboarded, the roof covered with shingle of white pine.

One pretty feature of this house is the corner tower, which adds a pleasing effect.

The basement is well lighted and cool, and contains a dining room, kitchen, a store room, hall, lobby, and two large pantries.

All the rooms on basement floor are wainscoted in

whitewood, neatly beaded, and finished in the natural wood.

On the first floor there is a parlor, sitting room, bedroom, hall, and lobby.

Three bedrooms, hall, bath room, and den on second floor, with three rooms finished off in the attic.

The inside trim throughout is whitewood, stained cherry, rubbed down and varnished, giving a very soft

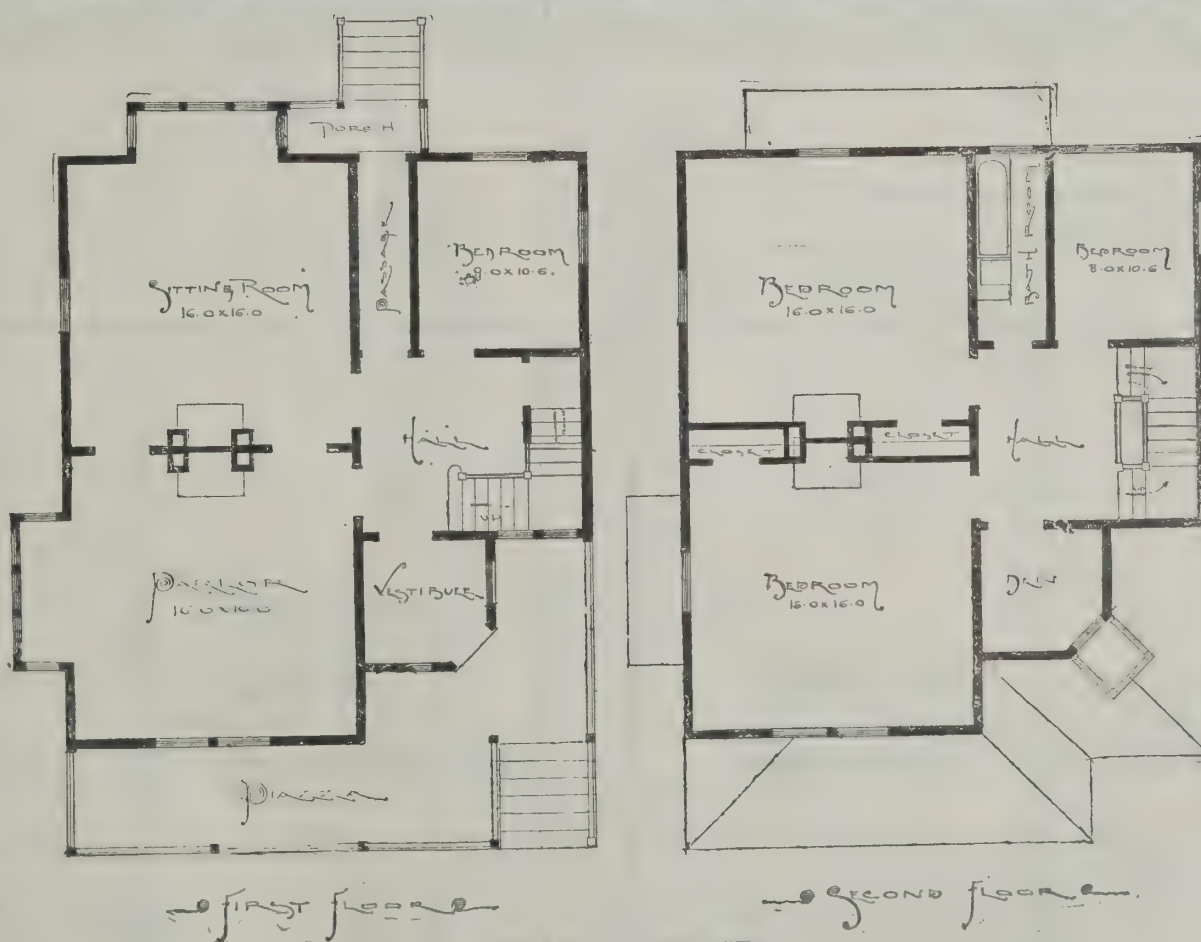
#### To Estimate the Power of a Stream.

To measure water roughly in an open stream, take from four to twelve different points in a straight line across the stream, and measure the depth at each of these points, and adding them together, divide by the number of measurements taken. This quotient will give you the average depth, which should be measured in feet. Multiply this average depth by the width in feet, and this will give you the square feet of cross section of the stream. Multiply this by the velocity of the stream in feet per minute, and you will have the cubic feet per minute of the stream. The velocity of the stream can be found by laying off 100 feet on the bank, and then throwing a board into the stream at the middle, note the time passing over the 100 feet, and dividing the 100 feet by the time, and multiply by sixty, gives the velocity in feet per minute at the surface. The velocity at the center is only eighty-three per cent. of that at the surface, and so only eighty-three per cent. should be calculated. For example, suppose the float passes 100 feet in ten seconds, that divided by ten and multiplied by sixty (seconds in the minute) gives 600 feet per minute as the velocity, and eighty-three per cent. of this gives 498 feet per minute as the velocity of the stream at the center and; the area of the cross sections multiplied by this will give you the number of cubic feet per minute in the stream. This, of course, is only a rough way of calculating, but it is often used, and is a good and simple way to obtain data to select a wheel by.—*Textile Record*.

#### Manufacturing Progress in the South.

In its semi-annual report on progress in the South, the *Manufacturers' Record* shows 2,023 new enterprises for the first six months of 1888, against 1,855 for the corresponding time last year, and 821 for the corresponding time of 1886. The amount of capital and capital stock represented by the list of new enterprises and enlargement of old plants for the first six months of 1888 were: Alabama, \$14,940,000; Arkansas, \$4,976,000; Florida, \$2,030,000; Georgia, \$5,782,000; Kentucky, \$13,144,000; Louisiana, \$1,776,000; Maryland, \$3,190,000; Mississippi, \$837,000; North Carolina, \$3,990,000; South Carolina, \$3,133,000; Tennessee, \$6,025,000; Texas, \$11,749,000; Virginia, \$5,965,000; West Virginia, \$3,993,000. Referring to the many new furnaces now going into blast in the South, the report says: "The production of pig iron alone in Alabama next year will greatly exceed in

value the entire value of the manufactured products in that State in 1880. In 1880 the value of the manufactured products of Alabama was \$13,000,000, and that of the agricultural products \$56,000,000, or considerably more than four times as great. In 1889 the value of the products of manufacturing and mining interests of that State will exceed the average yearly value of all the agricultural products. Moreover, the manufacturing and mining products will next year furnish fifty times as much freight to railroads as the entire cotton crop of the State. What Alabama is doing in developing her industrial resources is being vigorously followed by every Southern State."



A SEASIDE COTTAGE.

finish. The door and window casings are beaded, and corner blocks are at angles. The dining room, parlor, sitting room, and two bedrooms even have open fireplaces, with tile hearths and neat hardwood mantels.

The staircase is a very easy one, and has neatly turned newel, posts, rail and balusters complete, and finished in the most substantial manner.

The bath room is fitted up with bath tub and water closet supplied with hot and cold water, etc.

The staircase window is glazed with cathedral glass in varied colors.

This house cost \$3,500 to build. It is admirably arranged, contains spacious rooms, a broad piazza, etc.



A DOUBLE HOUSE FOR \$1,800.

This neat little double house was lately erected on Bassett Avenue, Bridgeport, Conn., for Mr. E. C. Bassett, at a cost of \$1,800 complete.

It contains twelve rooms, allowing six rooms for each family.

There is a cellar under whole of house, with a brick and stone foundation. The first and second story exterior is covered with clapboards.

The roof is shingled, and each side of front gable runs down and forms a roof for porch.

On first floor there is a hall, parlor, living room, and kitchen and dining room.

The parlor has a neat wood mantel.

There are two bedrooms with very large closets on second floor, and two bedrooms in attic.

The inside trim throughout is of white pine, with banded moulded casings, etc.

This trim is painted with lead and oil in tints.

The newels and balusters are in yellow pine, and are neatly turned.

The arrangement of this house is complete in all respects.

Our engraving was made direct from a photograph of the building taken specially for the SCIENTIFIC AMERICAN.

How to Grow Quinces.

Mr. Chas. L. Jones, of Newark, N. J., has had unvarying success with this fruit, and his trees have now been in bearing thirteen years. For several years he has gathered from each tree from 400 to 450 quinces, and last year the average was 475 to a tree. Mr. Jones

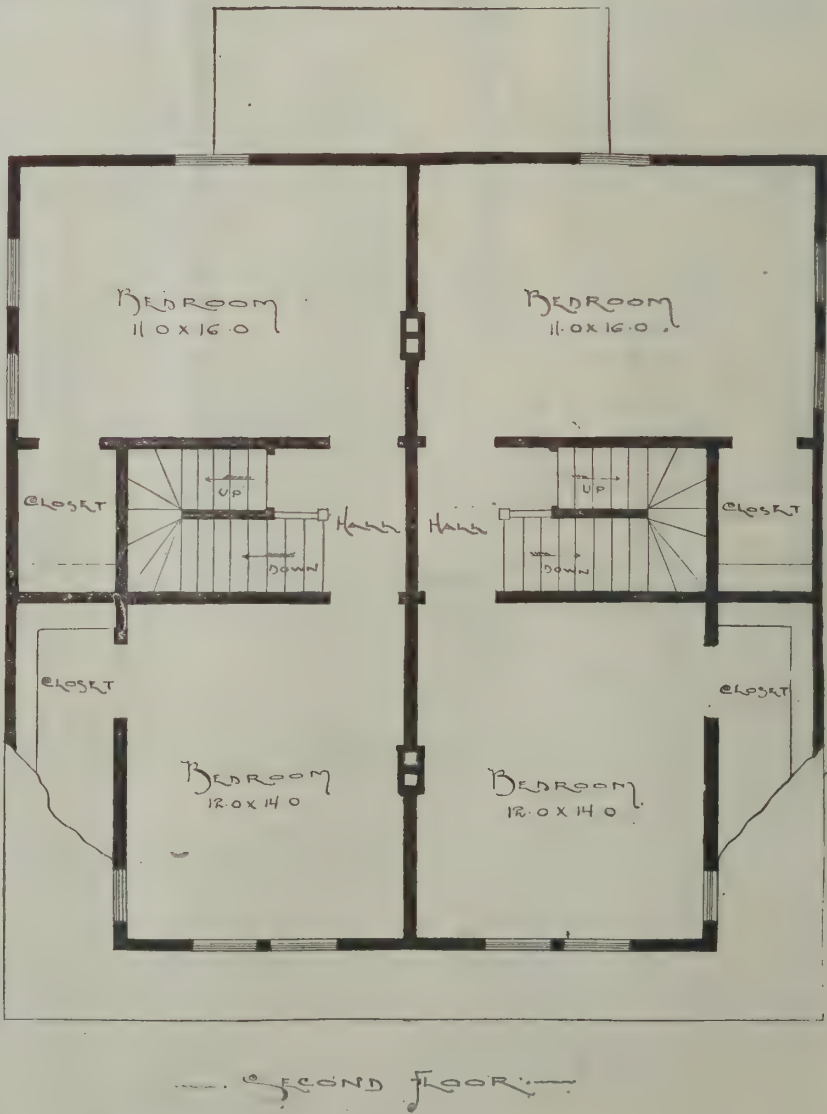
asserts that any one can grow quinces in a city back yard, and gives a full explanation of his method of culture in a recent number of the *Rural New-Yorker*. The first injunction is not to stir the ground deeply near the tree. The quince throws out many fine feeding roots near the surface, and these should be encouraged, fed, and protected. Hence the ground about the tree, to a distance as far as its branches extend, is undisturbed, except to keep down the weeds, which are cut close to the surface with a push-hoe. Late in the autumn a dressing of barn yard manure is given, and in early summer a mulch of salt hay

or other coarse material is added. This keeps the fine roots moist and cool, and furnishes them with food.

The next essential is proper pruning. This does not mean an occasional thinning out of the branches as they become crowded. Indeed, as the tree is often deficient of foliage, no thinning out is practiced, but every spring the new growth all over the tree is pruned back or "headed in," so as to leave but four or five buds. This means that from two to four feet of wood is cut from every thrifty shoot. As a result of this treatment, the entire outer surface of the tree is literally covered with fruit of good size and quality.

Mixed Wheats.

The English millers are at last determined to have some of the Dakota and Minnesota hard wheat in undoubted purity. But what will it avail them if they mix it with dirty, nasty, beany, praisish, ricey, thin, weak, worthless and ill-flavored Indian wheat to grind? In mixing grains they are on the wrong track, and no quality of grain will atone for their error in that line. Very good wheat mixed with very poor wheat will always produce poor flour. Very good wheat mixed with medium wheat will make only a medium flour. Very good wheat ground alone is the only thing that can possibly produce very good flour. Most of the fine American wheat sent to Europe has been spoiled there in the grinding, because the grinding is preceded by the insane practice of mixing.—*Milling World*.



A DOUBLE HOUSE FOR \$1,800.



## VILLA AT AULNAY-LES-BONDY.

The structure shown in the accompanying engraving is very simple, and yet very picturesque. It forms an elbow in plan, with the main entrance in the re-entrant angle, shown from afar by the pyramidal roof that surmounts it. On the ground floor there are a reception room, a large drawing room, a dining room beyond, a small independent drawing room, kitchen, and water closets outside. On the first story are the bed rooms, bath room, and linen closet. On the second story are the guest chambers, servants' rooms, and lumber room.

Simplicity of plan, outline, and color (burr stone, dressed stone, brick, and wood)—all this is found com-

height of eighteen feet above the surface of the ground.

In mentioning this, the New Orleans *Picayune* remarks that the artesian borings in that city and along the Gulf coast east of there, added to those at Galveston and on other parts of the Texas coast, prove that there are enormous possibilities in these subterranean waters for the people in the Southern lowlands.

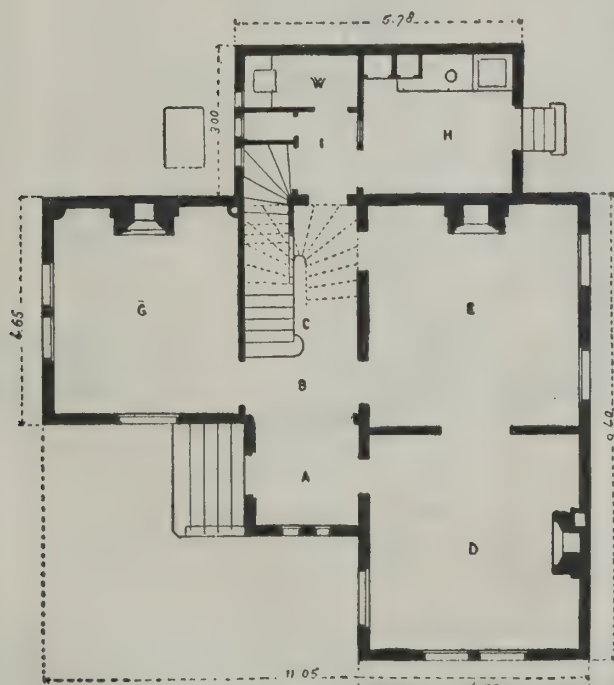
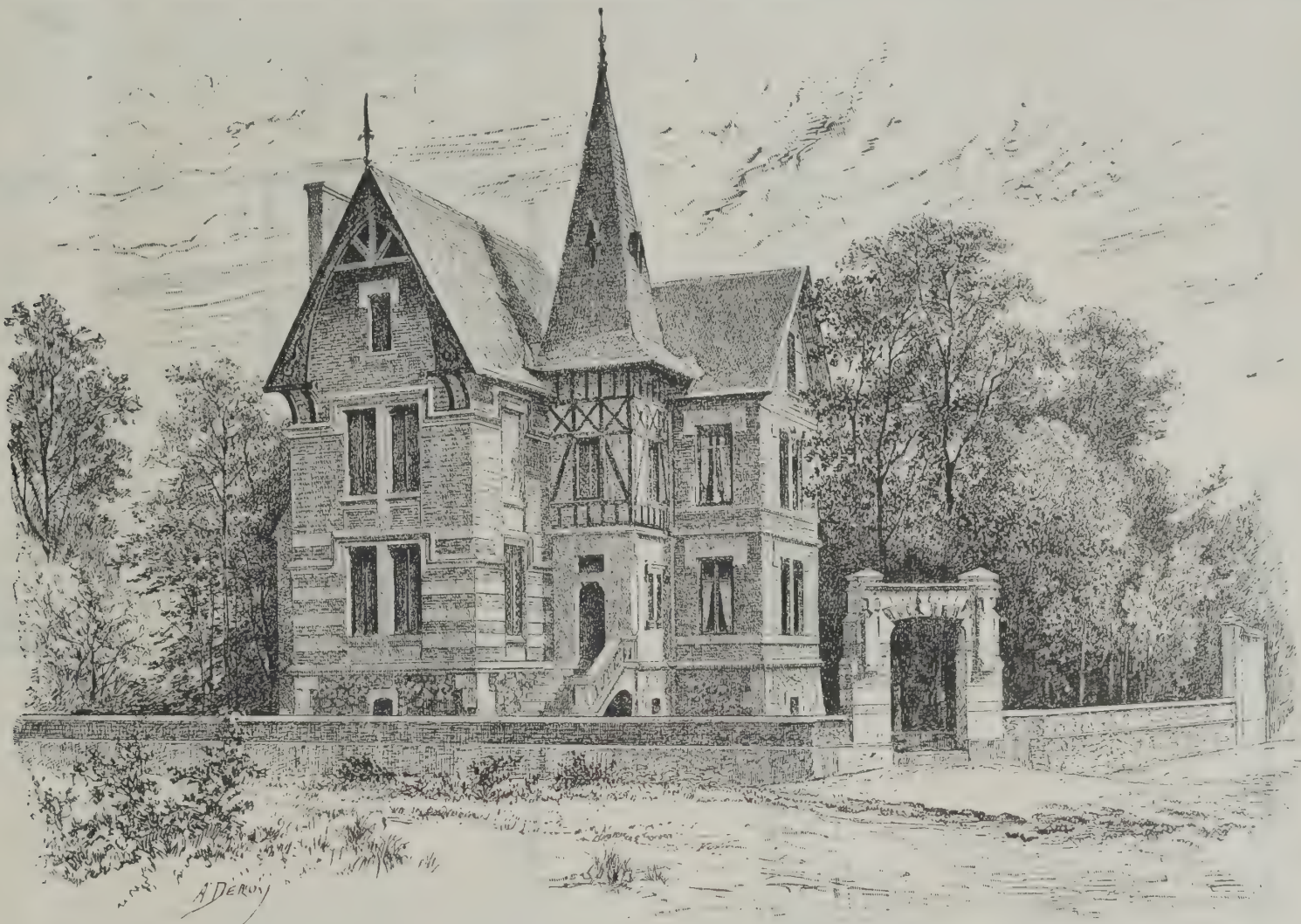
## New Ceiling for the Assembly Chamber of the New York State Capitol.

In our number for April we gave engravings of the interior of the chamber and the temporary scaffolding that now supports the ceiling. The plans for the new

will be to divide the ceiling into a number of panels. The highest point of the new ceiling will be about forty-five feet, while that of the present stone ceiling is sixty-seven feet; and it is expected that the acoustic properties of the chamber will be materially improved. This change will remove from sight Hunt's celebrated mural paintings, which, however, had already been badly damaged by water which had leaked into the masonry.

## Transplanting Large Pines.

Pine trees six inches diameter at the base and twenty-five feet high can be moved if sufficient root be taken out, and to do this cut back the tree some both at top



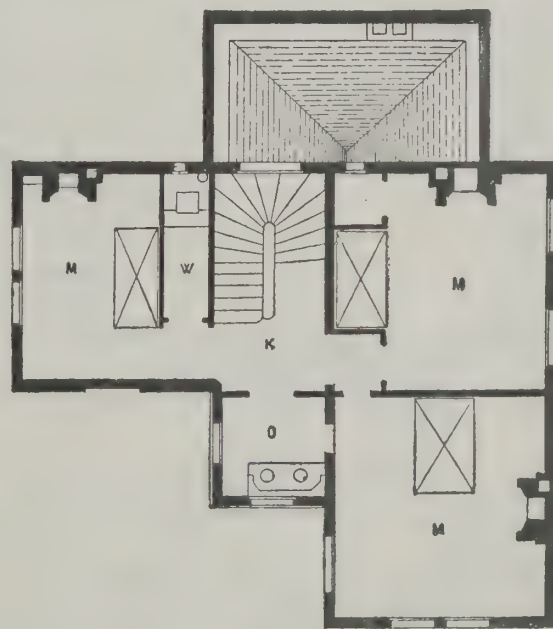
MAIN FLOOR.

## MAIN FLOOR.

- A. Entrance.
- B. Vestibule.
- C. Stairway.
- D. Grand parlor.
- E. Dining room.
- G. Parlor.
- H. Kitchen.
- I. Hall.
- W. Water closets.

## SECOND FLOOR.

- K. Hall.
- M, M. Chambers.
- O. Dressing room.
- W. Water closets.



SECOND STORY.

## A COUNTRY RESIDENCE IN FRANCE.

bined in this dwelling, which cost \$11,000.—*La Semaine des Constructeurs*.

## Galveston Artesian Wells.

Artesian borings are being extensively used in Galveston for securing water. The city stands on a sand island several miles from the mainland of Texas, and so far from any proper fresh water streams that could furnish a water supply that its people until recently have been wholly dependent on the rains. As a consequence, in seasons of drought there has been great suffering by the people and their domestic animals. Within the last year or two, however, borings have been extensively tried, with so much success that the city authorities are now contemplating a resort to artesian wells for a public supply, and have caused one well to be bored. It has reached a depth of 488 feet, and throws a stream of water the size of its pipe to a

ceiling were prepared by Mr. Andrews, the superintendent of public buildings.

The details of the projected work, as briefly set forth by an architectural contemporary, include the entire removal of the stone vaulting and the substitution of an iron ceiling covered on the under side with wood.

The four polished red granite columns are first to have their capitals removed and be lengthened nine feet; then the capitals are to be replaced, and on them will be set iron pillars nine feet high, supporting two heavy iron trusses six or seven feet deep and over eighty feet long, with ends resting on the north and south walls. On these main trusses will rest six smaller ones running east and west and carrying the beams of the attic floor. The wall supports of the trusses are to have roller bearings. All the iron work that would be visible from below will be encased in quartered oak, but its outlines will not be concealed, and the effect

and ends of branches, and in August or September dig a trench around the trees, say four or five feet from body, and digging below the roots, cutting them off. Leave the trees until the ground is thoroughly frozen in mid-winter (having, however, holes dug for their reception before winter sets in) and then dig under and raise them out with levers on to stone boats and transplant, packing ground solidly around them.

FULL plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York. Plans for the alteration and enlargement or improvement of buildings are also supplied.



**Poisonous Wall Paper and Carpets.**

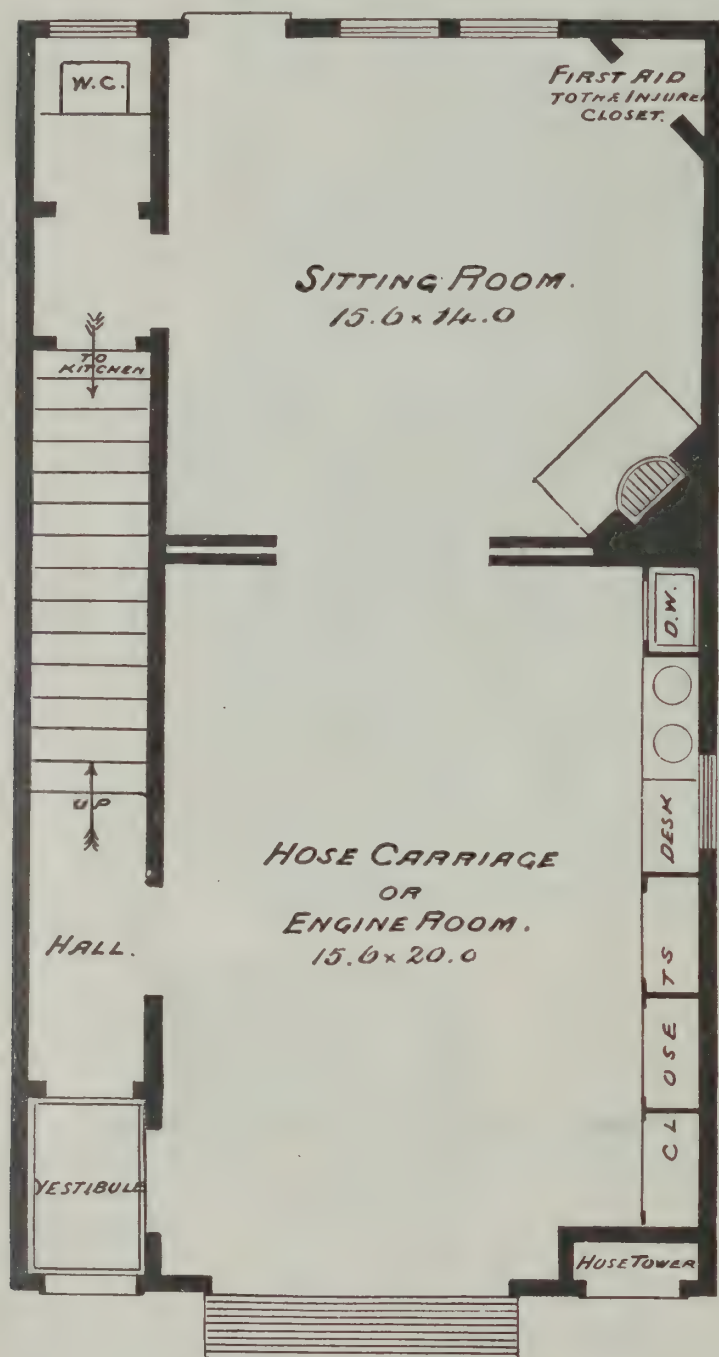
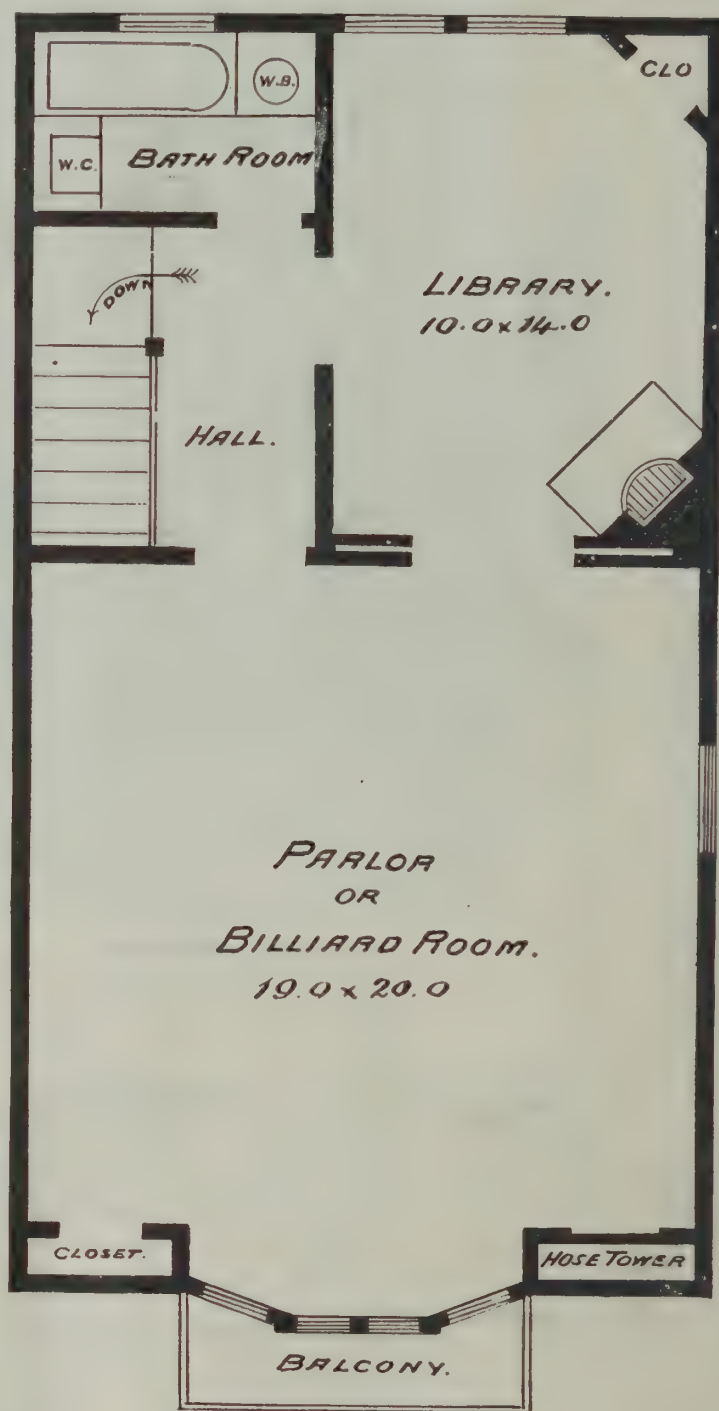
So much had been written about poisonous wall paper a few years ago, the paper manufacturers in this country found themselves compelled, by the force of public opinion, to stop the use of arsenical colors and resolve, in the pool in which they were all united, not to make any more. One great evil about this arsenical wall paper is the popular belief that it is only green colors which contain arsenic, while it is a fact that other colors, especially turkey red, are equally objectionable on that score. It was not American manufacturers alone who were guilty of using such colors, but it has been conclusively proved that European makers desiring to compete for the American trade by attractive colors in their goods, employed arsenic to oxidize their colors much more freely than our home manufacturers. One way of overcoming the objections of buyers to poisonous colors has been to give so-called guarantees. What the value of these is may be judged from a paper lately published by Dr. Charles

party from whom he purchases. The only safe way is positively to decline to purchase goods made with arsenical colors. The certificates of some of the best known foreign chemists even are not always to be relied on, for Dr. Harrington relates a case where eight samples of wall paper imported from England had been rejected in Boston as containing arsenic. The manufacturers had submitted this paper to no less an authority than Professor John Attfield, in London, who reported the samples as entirely free from arsenic, and indulged in some sneering remarks about the American chemist.

The samples were thereupon submitted to three of our best American chemists, who, after separate analyses, reported that the same samples all contained arsenic—one as much as over four grains of arsenic to the square yard. These eight papers were Chatsworth tale, Brandon, Malines, Iberia, Coniston blue, Monkshead, Wentworth on white and Wentworth on yellow. Whatever has been said about the colors in wall paper also holds good about carpets, hangings, furniture cover-

dates, the longer it may be expected that the cement will continue to acquire strength, and the greater the ultimate strength obtained. The actual strength demanded of a sample, and whether it is to be quick or slow setting, must be determined by the special requirements of the work in which it is intended to be used.

Quick-setting cements, as a rule, attain their greatest strength in about six months. After then there seems to be a falling off in tenacity; but to what cause this is due has yet to be discussed, as, in Mr. Faija's opinion, there is no apparent reason, theoretical or practical, why a strength once attained should be partially lost. The proposed adhesive test is, Mr. Faija declares, unquestionably uncertain and untrustworthy. The adhesion of a cement to any material depends as much on the nature of the other material as on the cement; and even where seemingly similar surfaces are secured, it is impossible to be sure that there may not exist slight differences which will affect the results obtained. The

**FIRST FLOOR.****SECOND FLOOR.****FLOOR PLANS FOR FIRE ENGINE HOUSE.—[See colored plate.]**

Harrington in the *Boston Medical and Surgical Journal*. He declares that the degree of reliability of such testimony depends greatly upon the character of the person or firm giving it; upon the character and ability of the chemists employed for the analysis; and upon the amount of mental reservation which may be made at the time of sale. He states also that there are houses selling these goods who give their patrons, in place of a guarantee, a statement that their goods are all examined by their chemists and are perfectly safe—the value of which statement is not clearly perceptible. Just such statements have been advertised. There are some houses who treat inquiries as to safety with withering contempt, descant upon cranks and other offensive persons, show themselves as lusty specimens of manhood brought up in the business, handling the alleged poison day in and day out without the slightest injury, and frighten their customers, who may not wish to be considered imbeciles, into buying without a guarantee of any sort. The manufacturer's guarantees, about which one hears so much, are hardly worth the paper upon which they are written to the purchaser from a retailer, because, even where the guarantor might be responsible, the purchaser has no means of redress aside from that which he may have against the

ings, curtains, and many other fabrics in every day use. Many headaches properly traced up might be laid to this cause. Sewer gas has undoubtedly often been anathematized for illness caused by arsenical colors.—*Amer. Analyst*.

**The Testing of Portland Cement.**

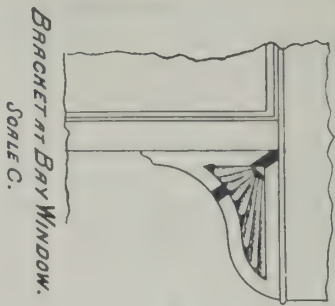
Mr. Henry Faija, M. Inst. C. E., has read, before the American Society of Civil Engineers, a paper on cement testing, in which he defined the object of testing cement to be the determination of its constructive value; while the necessities of a test are that it should be expeditious, complete, and reliable. The prime object of the paper was to support the recommendation previously made by a committee of the society in favor of the establishment of a uniform system of cement testing. According to Mr. Faija, the value of a cement may be determined by its fineness, and also by its tensile strength at two dates. The greater or less increase in strength between the two dates defines the growth, and determines approximately the ultimate strength to be expected from it. In practice, a test at three days and another at seven days from gauging enables a sufficiently accurate determination to be arrived at. The greater the increase in strength shown between these two

same objection applies to the sand test, which has the additional disadvantage that a considerably greater amount of skill is required to gauge a sand briquette than to gauge one of neat cement. With regard to the fineness of cement, Mr. Faija thinks that a residue of 10 per cent. on a sieve of 2,500 holes to the square inch is as much as can be expected of any manufacturer, unless an additional price is paid for extra grinding. The most important point, however, in the first determination of the quality of a cement is the absence of cracking or blowing. This fault is due to excess of lime, and is fatal to the soundness of a cement which exhibits it. To test for this fault, Mr. Faija uses a steaming apparatus of his own devising, in which thin pats of neat gauged cement are exposed to vapor at a temperature of 110° Fahr. The pats are left in this atmosphere overnight, and if they are perfectly sound in the morning, the cement is regarded as a safe one to use.

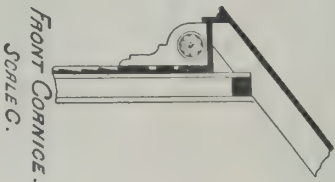
THE length of pipe laid in Paris for the distribution of power by compressed air already exceeds 30 miles. The compressing engines are of 3,000 horse power, and about 3,000,000 cubic feet of air are compressed daily to a pressure of 80 lb. per square inch at an expenditure of 50 tons of coal.



REPRODUCED BY  
PUBLIC  
BUILDING  
OFFICE



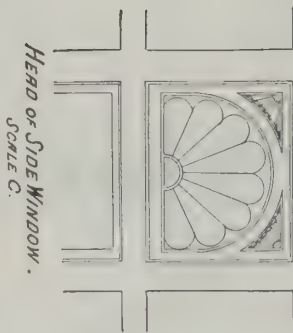
BRACKET AT BAY WINDOW.  
SCALE C.



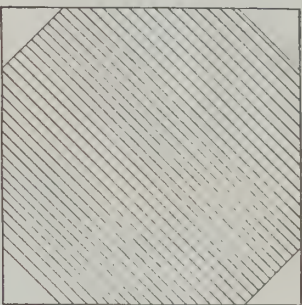
FRONT CORNICE.  
SCALE C.



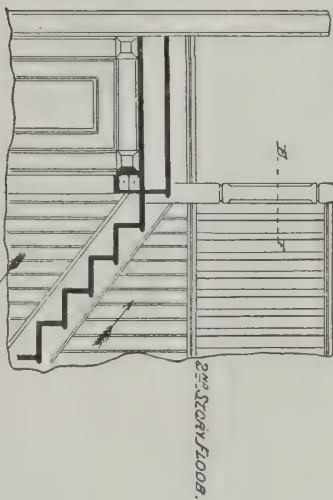
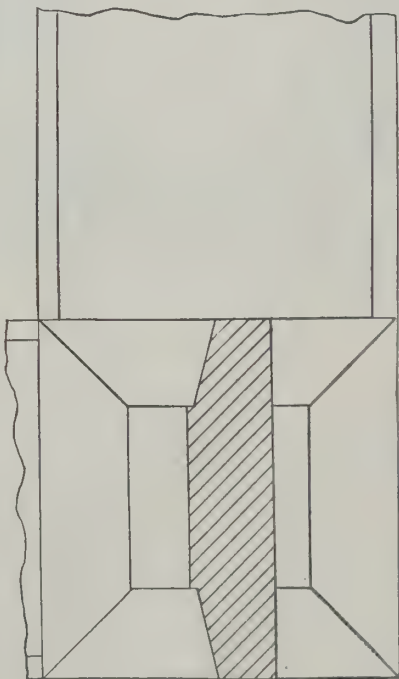
SECTION OF FRONT  
GABLE CORNICE  
SCALE C.



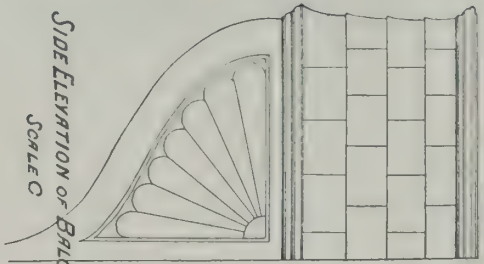
HEAD OF SIDE WINDOW.  
SCALE C.



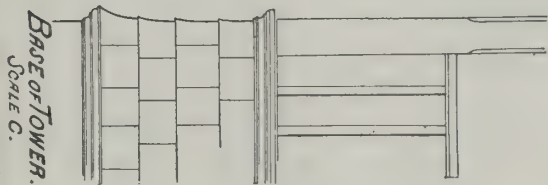
SECTION OF NEWEL AT E.T.  
SCALE D.



ELEVATION OF STAIRCASE. SCALE B.



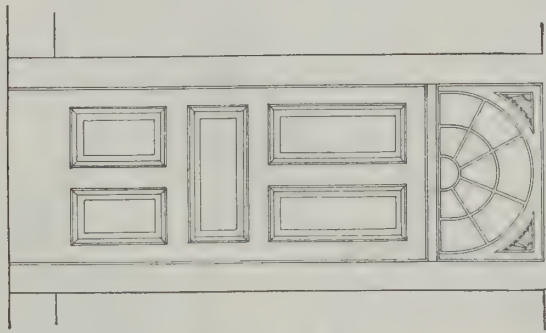
SIDE ELEVATION OF BALCONY.  
SCALE C.



BASE OF TOWER.  
SCALE C.



TOWER CORNICE.  
SCALE C.



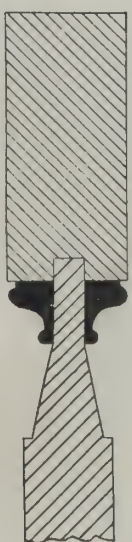
HALL DOOR. SCALE C.



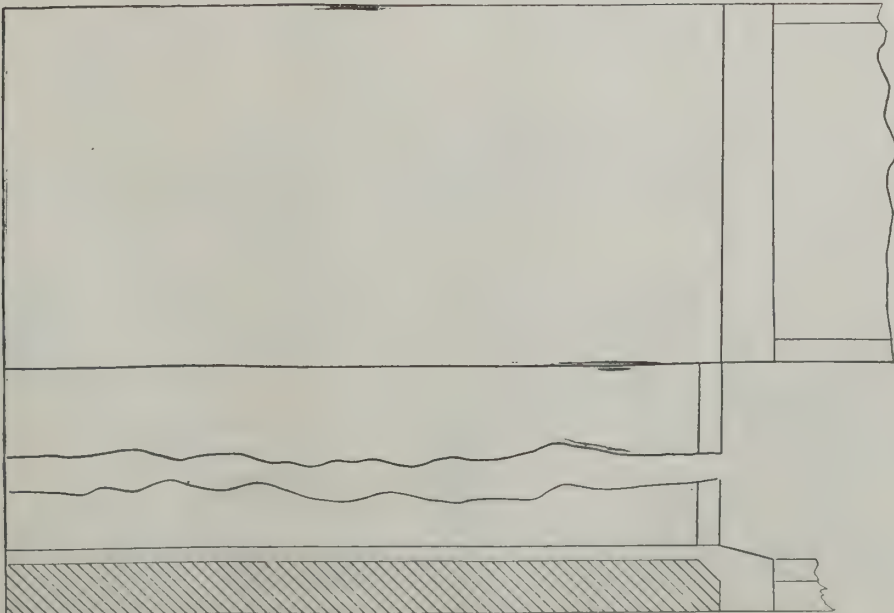
SECTION OF MAIN DOORS AT C.D. SCALE D.



SECTION OF MAIN DOORS AT A.B. SCALE D.



SECTION OF HALL DOOR. SCALE D.



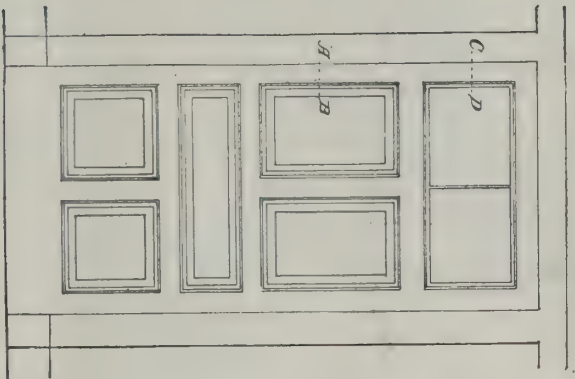
ELEVATION OF TRIM. SCALE D.



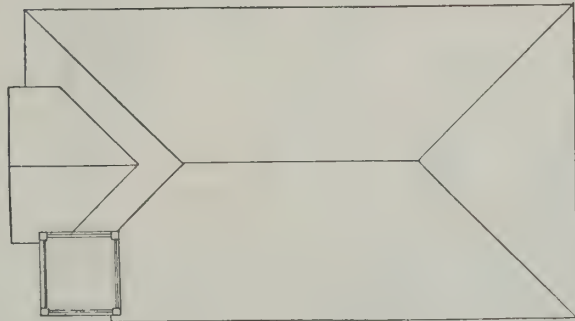
SECTION OF TRIM.



CELLAR PLAN. SCALE A.



MAIN DOOR. SCALE C.

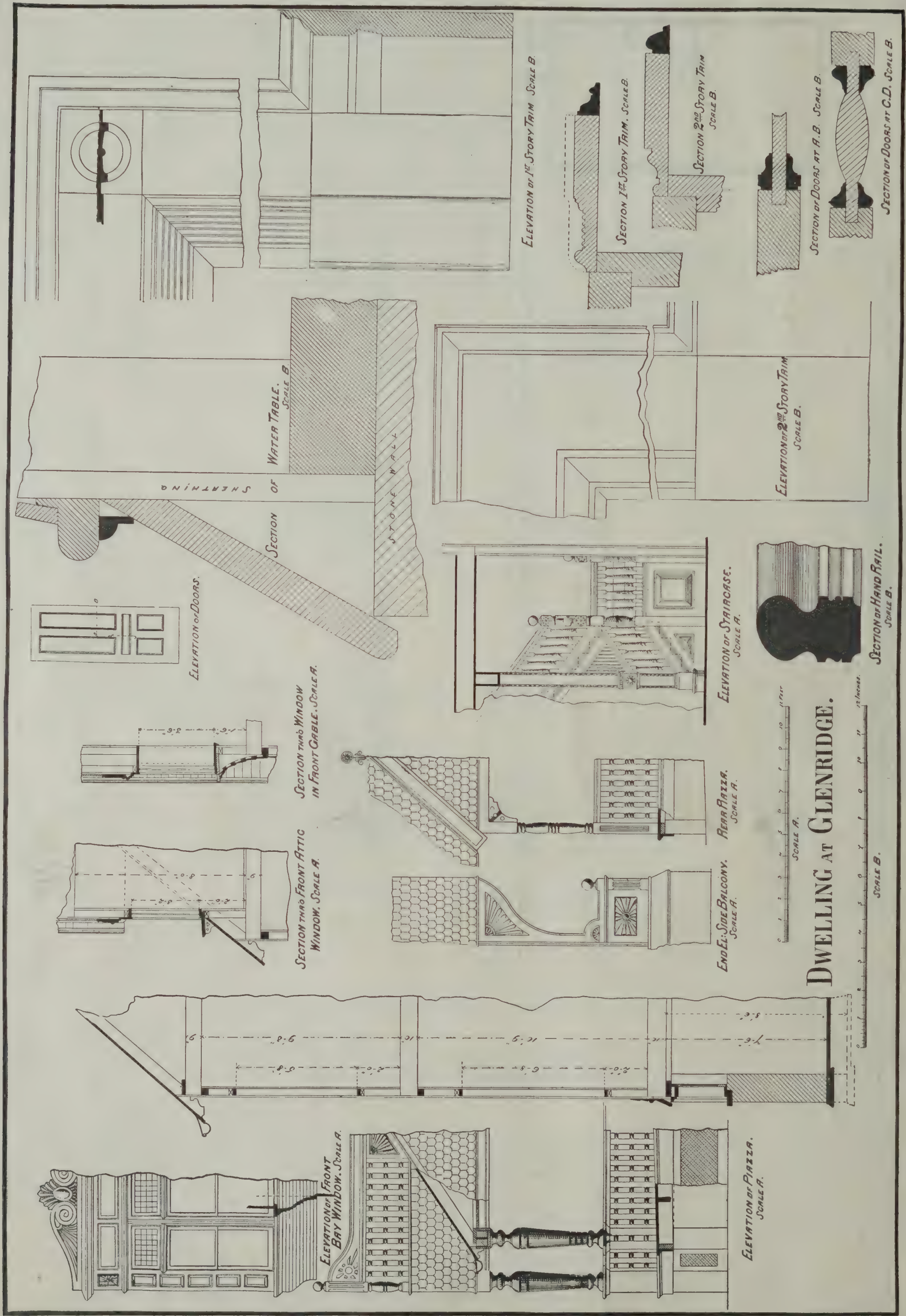


ROOF PLAN. SCALE A.

# A Fire Engine House of Moderate Cost.









## STABLES AT SYRACUSE, N. Y.

We illustrate the palatial stables of Mr. D. Edgar Crouse, Syracuse, N. Y., Archimedes Russel, architect. The plans are worth studying. We are indebted for our engraving to the *Architectural Era*.

## The Humming Bird.

BY THOMAS H. FAY.

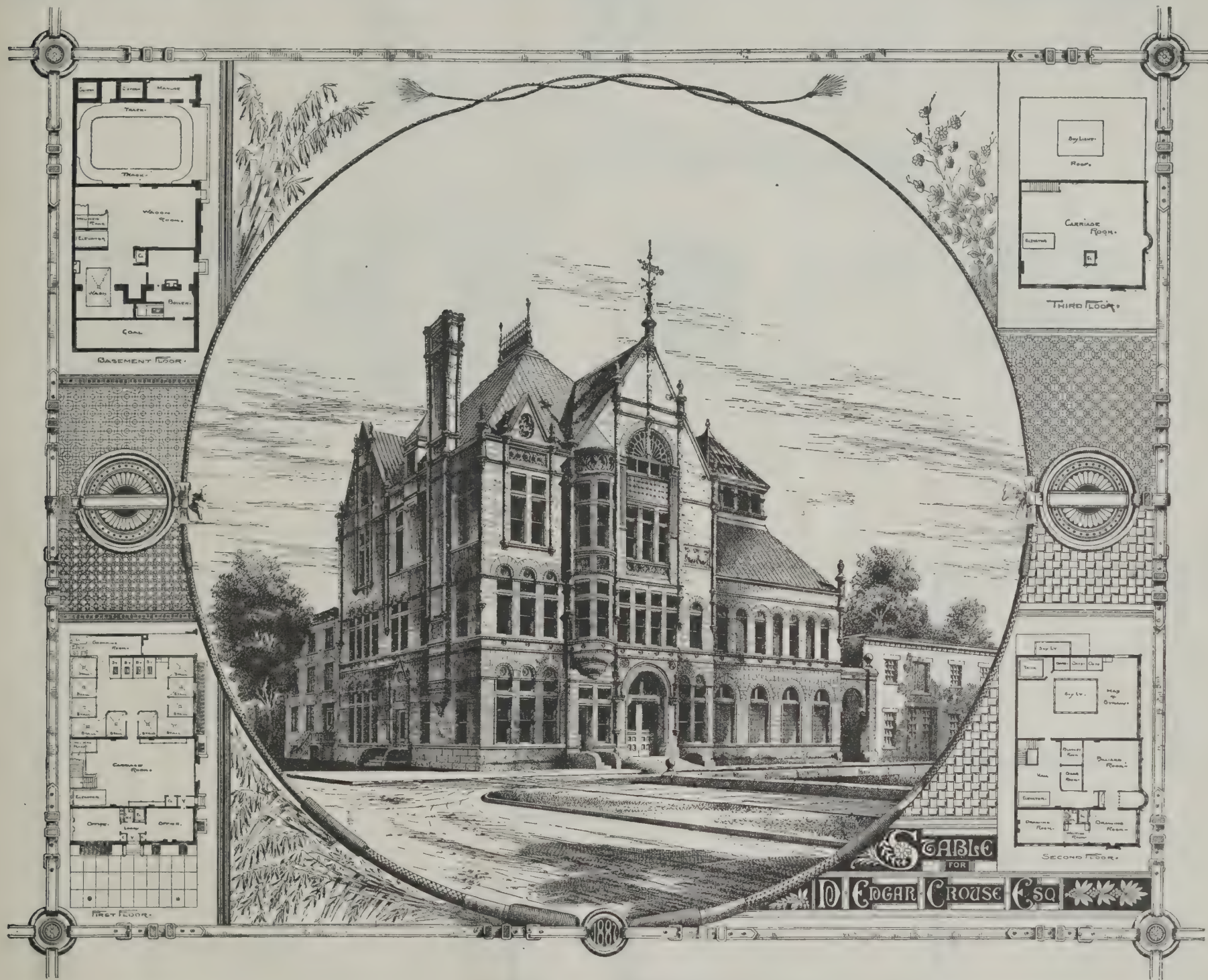
The old world has its gaudy paroquets and lories, and is the home of the showy peacock and the handsome tody; Australia boasts of her cockatoos and birds of paradise; but America has the crowning gem—the smallest and at the same time the handsomest of all bird creation—the humming bird. No other land can produce its equal in beauty; and it is found nowhere but on our continent and adjacent islands.

An English writer says: "This bird takes the place of the sun birds of the old world;" but he should rather have put it the other way, for sun birds are plain compared with our little hummer. This bird is

petual twilight, that these birds are as plentiful as the insects that infest the swamp forests. Some species are scattered over a vast extent of country, while others are confined to a tract of less than five hundred yards, or are not found beyond the limits of a single mountain. These latter have shorter and comparatively weaker wings than those that are migratory. Our little hummer is a bird of the air, disdaining Mother Earth, and consequently well adapted to the ethereal element. Its body is light and at the same time well built, and the wings, as a rule, exceed the tail in length, and are very powerful for birds so small; in fact, a greater part of the muscular system is concentrated in the wings. The legs are small and weak, and therefore but little used. The feet are shaped like those of the climbing birds—as the parrot and woodpecker. The *sternum* or breast bone is very sharp, as in the case of the swallow. This, and the extreme size of the wing, give the birds a power of flight which is marvelous. Seldom alighting, not even to feed, but capturing their

to the back of the skull, and thence upward and forward to meet at a point above the eyes. Some species have small barbs on the end of the tongue, which further assist them in capturing their food—the tongue of the woodpecker is also supplied with these barbs. The muscles of the tongue are arranged spirally like a corkscrew, so that the tongue can be projected or retracted at will.

In the shape of the tail there is much variety; some species have it long, slender, and drooping, while others have it short and stumpy, as if somebody had mischievously cut it short with a pair of scissors. Some are deeply indented or fork-shaped, the forks turning up or down as the case may be. Some are very oddly shaped, as in the case of the racket-tailed humming bird, whose caudal appendage resembles a racket bat; and others have fan tails. Some of the birds are crested, or have tufts of feathers springing from the sides of the neck, looking like extra wings; and a few species have their legs covered



STABLES AT SYRACUSE, N. Y.

the smallest known representative of the *aves*; the largest humming bird being about the size of our common house wren, while the smallest are about the size of a bumble bee, and all are clothed with plumage of the most gorgeous colors—ruby, amethyst, topaz, emerald, and burnished gold. Some writers have properly titled them "living gems," and the Spanish settlers of South America have given them such names as "Rays of the Sun" and "Tresses of the Day Star."

While found most abundantly in the tropical portion of this continent, where they fairly swarm, there is no part of America that has not its representative; even in the icy North the nootka braves the rigors of a boreal climate. Here in New England we have but one species, the ruby throat, although one ornithologist, Mr. Webber, asserts there is another species, resembling the female ruby throat, and consequently confounded with it, which he calls the green humming bird. Only five species are known north of Texas, while the greater part of this family resides in Mexico, Central and South America, and the West Indies.

In these places they are to be found everywhere; in the open fields, gardens, and groves; high up in the snow-capped Andes, and in the dark, gloomy, almost impenetrable savannas, where not a ray of sunshine ever enters, so thick is the foliage. It is here, in a per-

food while hovering over a flower, they all the time keep up a constant humming caused by the vibrations of the wings, which move so rapidly that they appear like a mist. It is this humming which has given the bird its name.

The food of these birds consists of insects and honey, although the older naturalists, and, in fact, many of to-day, erroneously believe that they consume only honey. To obtain their food the bill and tongue are admirably formed; the former being long and slender, enabling the bird to reach into the deepest parts of a flower. The shape of the bill is variable; in most cases it is nearly straight, but in many species it is curved either up or down. In all cases it is pointed, and in some species there are short rudimentary teeth inclining backward. Perhaps all birds formerly had teeth, if by the process of evolution they have emerged from the reptiles, but now these species of humming bird may be said to be the only living birds which retain them.

The tongue is also well adapted to procuring food; it consists of two flexible tubes joined together for a greater part of their length, but separating toward the end into two spoon-like parts, which act like a pair of tongs in seizing insects and taking up the honey; within the mouth the two tubes again separate, passing

with thick down, for all the world like muffs. The *laminae* or fibers of which the feathers are composed are of different colors, and, as the bird moves, they, of course, alter their position, and the change of colors is the result.

A more fierce or courageous bird does not exist than the humming bird in the defense of its nest, or in the mating season, when the males are almost bursting with jealousy; they will fight until one is mortally wounded, or until, too exhausted to sustain themselves any longer, they both fall to the ground. In the defense of its nest it knows no fear. The size of the enemy—be it bird, beast, or man—makes no difference, and it is seldom that it does not come off victorious.

The nest is built with great care as regards strength, warmth, and secrecy, and in a manner to excite wonder that such a creature could devise such a structure and be capable of building it. It is constructed of such fibrous matter as may be at hand, as grass, stalks, cotton, etc., and lined with vegetable down. The outside of the nest is covered with moss, bark, or lichens, so that it looks no more than a knot on the branch upon which it is built, while the whole is glued together with the saliva of the bird. The material is generally wound in part around the branch on which the nest is built, so that it is firm and difficult to detach. It is cup-



shaped, and, in the smallest of them, measures not more than half an inch across the widest part. In this tiny domicile two pure white eggs, very small, to be sure, but quite large in proportion to the size of the bird, are laid, and after ten days of patient sitting are hatched. The young are able to fly in a week, and another brood takes their place.

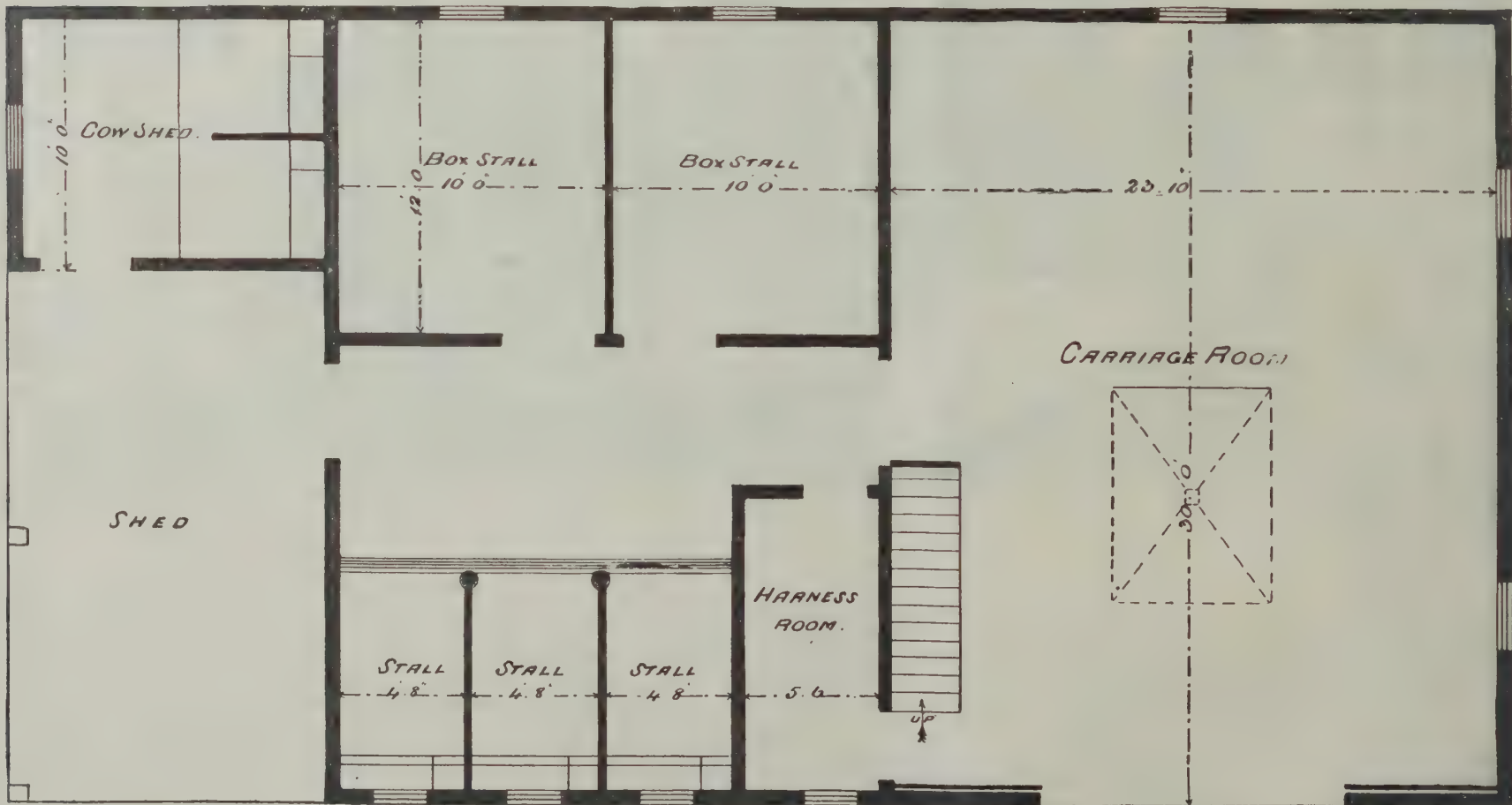
The voice of the greater part of the family of humming birds consists only of a shrill chirp, the emphasis

these birds. Goldsmith's "Historia Naturæ," published in 1774, mentions "six or seven species, from the size of a small wren down to that of a humble bee." Since then, new species have been constantly discovered, until now there are about three hundred known. A good authority on this subject estimates that only about one-third of the family has been discovered, because of the nature of their abodes, which in part have never been penetrated by a human being. It is safe

taining full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.

CARRIAGE HOUSE, BARN, ETC.

The principal dimensions are as follows: Front, 45',



FLOOR PLAN.

CARRIAGE HOUSE, BARN, ETC.

depending on the circumstances, as love, jealousy, anger, or fear; but Mr. Bullock, in his "Six Months in Mexico," says that one species, "the least humming bird," has a "slight querulous note;" and Mr. Gosse, in his work on the "Birds of Jamaica," describes a species which he calls the "Vervian humming bird," but which is probably the same as that spoken of by Mr. Bullock; he says it has a very weak but sweet note, "a continuous melody for two minutes at a time." All others, he says, only chirp.

One hundred years ago very little was known about

to say, however, that about six hundred species exist, and this is wonderful when we consider the fact that the whole bird fauna of Europe consists of about two hundred and seventy species.—*Swiss Cross.*

If any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, con-

not including shed. Side, 30', over all. Shed, 12' x 10'. First story, 9' 6". Second story finished up to roof. Foundation of stone in trenches. No cellar. Finish to roof eaves, clapboards. Roof shingled. The cow stalls are separate from the horses'. Two large box stalls and three single stalls. Harness room near to stalls and carriage room. Stairs conveniently located, Carriage room to hold from six to eight carriages. Carriage wash conveniently arranged. The loft has ample room for storing hay and straw. Feed and grain bins located in loft. Shed at end. Cost, \$2,200.









A FIRE ENGINE HOUSE OF MODERATE COST





- ADWELLING AT GLEN RIDGE, N. J. -



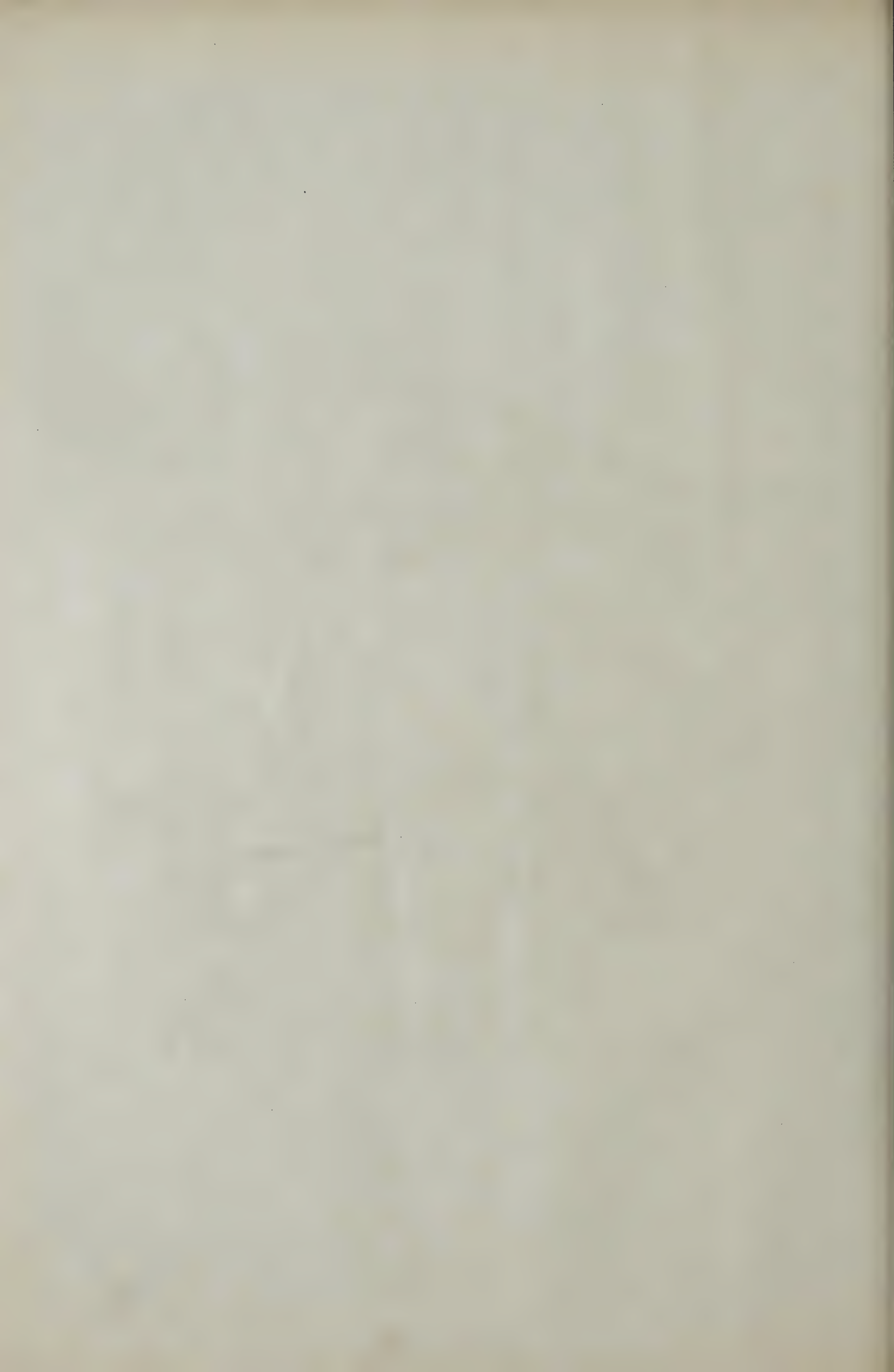


A FIRE ENGINE HOUSE OF MODERATE COST











## CHURCH AT BECKENHAM, KENT.

This church will accommodate between five and six hundred persons, all on the ground floor, and is divided into nave, aisles, and transepts, the nave being separated from the aisles and transepts by an arcade of arches supported on granite pillars, above which there is a high clerestory lighted with large three-light windows. There are two main entrances: one in the center of the elevation to Crescent Road and one in the tower. The vestries, etc., are placed between the church and the present schoolroom, and the roofs are kept low, in order to preserve good light to the latter. The church parlor will accommodate about eighty persons. The flooring of the church will be laid with a slight ascent from the pulpit. The main elevations are faced externally with Kentish rag stone, with Bath stone dressings to doors, windows, etc., and internally the walls are faced with Portland cement, with Bath stone dressings to doors, windows, arches, etc. The internal wood-work generally is of St. John's pine, stained and varnished. The architects are Messrs. J. W. & R. F. Beaumont, London.—*Building News.*

## A Perfect Hen House.

BY A. F. HUNTER.

The house runs east and west, is six feet high to the eaves front and back, is fifteen feet wide, and can be twenty-four, thirty-six, forty-eight (or any multiple of twelve) feet long. A walk three feet wide extends along the back (inside) into which all the pens open. The pens are twelve by twelve feet, giving 144 square feet of floor space, which is sufficient for 15 fowls—as large a number as can be safely penned together and make them lay well. If built upon sloping ground, the floor space should be leveled, and make the back side a bank wall; laid up in mortar or laid up dry and well pointed, this wall is a great protection from frost and cold, as, since this side will be the north or northwest, the biting winds will blow quite over a house so sheltered. Such a house, having a ground floor, can be built of matched boards, using 2×4 scantling for frame and rafters, and the roof reasonably well shingled for about \$2 per running foot; that is, a house twenty-four feet long, making two pens, will cost about \$50; forty-eight feet long, making four pens and accommodating 60 fowls, \$100, and so on. One common-sized window (say of 9×12 glass, 12 lights) in the front of each twelve foot pen is *all* that should be put in. (The house of the writer has a window in each end also.) It is a mistake to put too much glass in a hen house, as the sun's rays warm the air as in a hot house in the middle of the day, and then the temperature will fall very low at night in cold weather; extremes of heat and cold are much worse than steady cold, for which the hens are prepared by warm clothing.

There should be a board partition between the pens to a height of at least three feet, and then lath two inches apart or wire mesh; between the pens and the wall lath or wire mesh only, which allows of free circulation of the air and adds the air space taken up by the walk to the capacity of the pens. Wire mesh should be tacked over the windows inside to prevent the hens dashing against the glass when suddenly startled; this precaution will save its cost many times over in glass alone, not to mention the annoyance of finding a pane broken just as the mercury is curling up in the bulb. It is no fun to set a pane of glass in that weather.

In some houses the roosts are placed against the partition between the pens and the walk, some ten to

twelve inches from it and about thirty inches from the ground or floor. In this case the platform to catch the droppings will be 22 inches from the ground, and the nest boxes can be built in just under this platform, and below the boxes the feed trough can be placed, both trough and boxes being provided with swinging doors or covers opening into the walk, which facilitates the collecting of the eggs and the morning feeding.

In the writer's house the roosts are placed along the partitions between the pens, which has the advantage of being on the opposite side of the pen from the little door opening into the yard and so away from a draught, as, when on the roosts, the hens have a board partition a foot behind them and extending just above their heads. Another advantage is that one has a complete view of the pen, nests and all, as he saunters along the walk.

but dampness is one of the greatest foes to fowls, and if the ground is damp a tight board floor should be put in, one to two feet above the ground, and five or six inches in depth of dry sandy loam or coarse sand put on top of it for the hens to scratch in. This earth should be removed each summer, the house thoroughly whitewashed, and a new supply put in.

Some well-known breeders are strongly in favor of this board floor (although it increases the cost of the house), and think it an advantage to have it two feet from the ground, the space beneath inclosed on the east, north, and west, but open to the south, which gives a capital sheltered spot for the hens to scratch and dust in; a small trap door and two or three steps giving them access to it from the pen above.

Ventilators should be put in about six inches square carried up a foot or more above the ridgepole, and capped with a tiny roof to exclude the rain. These can be so placed between each two pens that both will be ventilated by it (although one to each pen would be better), and should be brought down to within a foot of the ground for winter ventilation. A sliding trap near the roof will be best for summer, although with every window in the house raised to its full capacity in summer the pens are usually well ventilated.

I called this house perfect, but it is not that! It *is* very convenient, is cheap, is warm if well built, and has fewer drawbacks than any house I have ever seen, and I have seen a great many. Two or three years since I visited a hen house on which every possible expense had been lavished. It was over 500 feet long, would accommodate 700 to 800 hens and cost \$7,000. It was covered all over with fancy shingles painted various colors, was lathed and plastered within, the floor solid cement, and partitions between the pens of brick laid in cement, the doors leading into the yards being of cast iron, with an iron frame set into brick with cement, etc., etc. I wouldn't take the gift of it and be obliged to run it, because the expense would be double the income from it.

The great beauty of the house we picture above is that it is economical to build and economical of time in caring for the flock—both important to the average man and woman on a farm. Having evolved the design from several different ones and tested it by some years' experience, I confidently recommend it to any one intending to build.

The following from Mr.

Rudd's last "Anti-poverty Poultry Paper," in the *Poultry Yard* for June 16, is good sense and we commend it to our readers:

"The corner stone of success in the poultry business with the beginner is the firm and unwavering belief—and which cannot be thumped out of his noddle by every lazy, shiftless, unsuccessful vagabond whom he meets—that there is a respectable living in it, that there is *more* than a living in it, that there is money in it. The next important thing is to resolve that he *will* succeed. Then the battle is half won, and he will soon secure his proper share of this money, which proper share, by the way, he will discover is precisely the amount he is willing to work and dig for. With the veteran poulterer this belief referred to has long since become knowledge, and no time is lost nor energy wasted in discussing theories or solving riddles. Hence his continued success year after year."—*N. E. Farmer.*

WESTMINSTER Bridge, London, is 1,160 feet long and 85 feet wide—the widest bridge in the world.



NEW CONGREGATIONAL CHURCH BECKENHAM KENT

J.W. &amp; R.F. BEAUMONT ARCHITECTS

Below my roosts are platforms, made of matched boards, twenty inches wide, to catch the droppings. A strip of furring (1×3) nailed along the front and back of this platform stiffens it greatly, keeps the droppings inclosed, and makes a shallow pan of it. This platform should be sprinkled over with land plaster, fine sifted coal ashes, or dry earth to catch and hold the ammonia, which otherwise would escape to contaminate the air and, worse still, be lost from the fertilizer. Beneath the platform is placed, first, a water basin, which is next the walk and can be refilled from it. Two feet back of it is a nest box set back to the light so as to be secluded (a hen loves a secluded nest); next, a shallow dust box containing fine ashes or dry earth for a dust bath, and in the south corner a shallow trough about two feet long for cracked oyster shells. The feed trough sets in the middle of the floor and a second nest box in another corner, back to the light.

If the ground on which the house stands is dry and well drained, as it naturally will be if it is on a gentle slope, the fowls will do better if the earth is the floor;





RESIDENCE OF D. W. BOND, FLORENCE, MASS.

RESIDENCE OF CHAS. KEITH,  
GREENFIELD, MASS.RESIDENCE OF A. B. WALLACE,  
SPRINGFIELD, MASS.RESIDENCE OF WILLIAM ARNOLD,  
WEST SPRINGFIELD, MASS.

RESIDENCE OF N. H. WHITTEN, HOLYOKE, MASS.

RESIDENCE OF E. C. SHELDON,  
SPRINGFIELD, MASS.RESIDENCE OF W. C. POMEROY,  
NORTHAMPTON, MASS.RESIDENCE OF JOS. L. MERRICK,  
HOLYOKE, MASS.RESIDENCE OF W. M. MERRILL,  
SPRINGFIELD, MASS.RESIDENCE OF MRS. ALMIRA COOK,  
WOONSOCKET, R. I.

CITY ASYLUM, NEWPORT, R. I.



RESIDENCE OF H. D. SCOTT, NEWPORT, R. I.

RESIDENCE OF GALEN DAVIS,  
NEWPORT, R. I.

RESIDENCE OF MARK HOUGH, WOONSOCKET, R. I.

RESIDENCE OF C. W. COOK,  
WOONSOCKET, R. I.

SOME NEW ENGLAND RESIDENCES.





**Examination Questions for Plumbers.**

In view of the examinations now being held in this city for applicants for plumbers' licenses, the publication of the following list of questions propounded by the examiners last year will doubtless prove interesting; and, although the questions this year are not likely to be the same as appear on this list, the plumber who familiarizes himself with the subjects referred to in this question list will without doubt stand a better chance of passing the present examination:

1. State in general terms the drainage and plumbing requirements of a city dwelling.
2. Give a short description of the principal materials and fixtures used in drainage and plumbing.
3. Describe the different classes of water closets, slop sinks, and scullery sinks in use in this city, and state the advantages and defects of each.
4. Write a concise specification of materials and workmanship required in the plumbing of a house, as shown on the accompanying plans.
5. Give a description of the different makes of traps, stating the advantage and defects of each.
6. Describe the arrangements necessary for the proper disposal of subsoil water, rain water, and sewage.
7. Describe the manner in which the following joints should be made: (a) connection of soil pipe with street drain; (b) of lead with iron pipes; (c) of iron pipes with each other; and (d) of a water closet with a soil pipe.
8. What purposes do ventilation or anti-siphon pipes serve, and how should they be run?
9. Where should traps in fixtures be placed, and how should connections from overflows be made?
10. What is the benefit of foot ventilation, and where should it be placed?
11. Why should a soil pipe be carried out through the roof, and what circumstances should govern its position and height?
12. How should the main trap of a house drain be set, and what should govern its position?
13. What are safes under fixtures for, and where should water from same be discharged?
14. How should the waste water from a refrigerator be disposed of?
15. How should overflows from supply cisterns be put in, and where should the waste from same be discharged?
16. How would you dispose of a safe waste from urinal?
17. Describe the construction of a grease trap, and under what circumstances should one be used?
18. How should the water pipes in an ordinary house heated by stoves be run to prevent freezing?
19. In what manner should water and waste pipes be run and fixtures set to meet the requirements of first class work?
20. Describe the different methods of testing soil pipes, drains, etc.
21. Describe the methods you would follow to discover any sanitary defects in a house. Plumbing and drainage defects are not alone referred to in this connection.
22. What conditions cause the movement of air in ventilation ducts or pipes, and what are the principal retarding influences?—*Canadian Architect.*

**Road Improvement.**

Among many persons who have devoted their attention to this subject may be mentioned Mr. H. W. Thornton, of Millersburg, Mercer County, Illinois, and as a result of some twenty years' experience he recommends the following method of road drainage:

Lay a line of tile lengthwise along the center of the road at a depth great enough to draw the water from below the bottom of the open ditches by the road side. If sand is most convenient and cheaper than gravel or broken stone, refill the ditch in which the tile is laid to a depth of six inches above the tile with soil to hold the sand above, with which the remaining portion of the ditch is to be filled. Place a coating of sand six or eight inches in depth and six feet in width over the center of the roadway, thus leaving six or eight feet on either side of this track for a dry weather road. The theory is that continued rains would soon put the central track in use, thereby facilitating drainage of the surface water into the sand or gravel over the tiling, and thus secure perfect drainage.—*Trustees' Trade Journal.*

IN connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

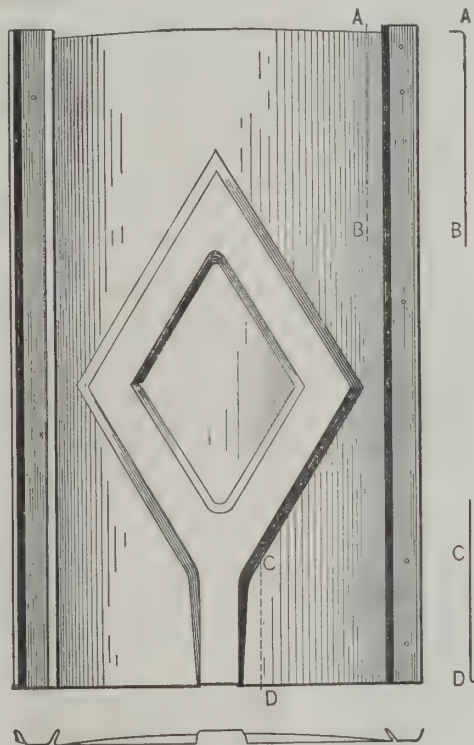
**THE "PATTEN" METALLIC SHINGLES AND SIDING PLATES.**

A kind of roofing which is easily put on, is economical in the matter of first cost, and will be ornamental as well as durable, while rendering it impossible for the roof to leak, is manufactured by Messrs. Gummey, Spring & Co., of No. 1023 Market Street, Philadelphia,



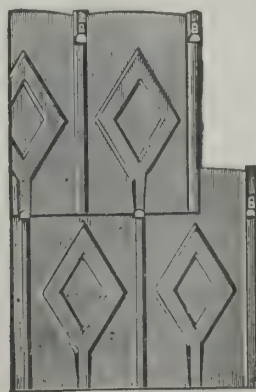
MASTER CARPENTERS' HOUSE IN BUILDING TRADES PROCESSION, PHILADELPHIA, SEPT. 15, 1887.

Pa., and known as the "Patten" metallic shingle. A plan and sectional view of the shingle is given in one of the accompanying illustrations, with a smaller figure showing the manner of breaking joints. This roofing is made from tin and terne plates, although sheet copper or other sheet metal may be used. The form of the shingle is such that it is not affected by expansion and contraction from heat and cold, there being oppositely



THE "PATTEN" SHINGLE.

inclined flanges on the right of the shingle, making a flat valley in which the fastening nails are driven, while corrugations on the left side of the shingle pass over the flanges of the shingle already attached, as the roof is being laid, locking the second plate thereto. A securer or cleat passes over the wood which covers the joint of the plates below, in laying each upper course, drawing down upon the joint and preventing the



THE "PATTEN" SHINGLE-BREAKING JOINTS.

upward passage of water by capillary attraction, while neither snow nor rain can beat under. This roofing requires no solder, is only one-eighth the weight of a slate roof, and can be artistically treated to harmonize with the general style of the structure to which it is applied. In the procession of the building trades dur-

ing the constitutional centennial celebration in Philadelphia, last year, the "Patten" shingles were selected over other makes for use on the house which represented the master carpenters' section in the procession, a view of which is shown herewith.

**The Pool of Bethesda.**

A discovery has been recently made in Jerusalem by Herr Conrad Schick, which appears to be nothing less than the "Pool called in the Hebrew tongue Bethesda" (Bethsaida or Bethzatha, St. John v, 5).

An apparently uninterrupted chain of evidence from the year A. D. 333 to the year 1180 speaks of the Probatica Piscina as near the church of St. Anne. The place spoken of is said by the earliest writers to have formerly had five porches, then in ruins. Nothing was known of the pool described by those writers until quite recently, when certain works carried on by the Algerian monks laid bare a large tank or cistern cut in the rock to a depth of 30 feet. It lies under, but not immediately under, a later building, a church with an apse at the east end. The cistern is 55 feet long from east to west; north and south it measures 12½ feet in breadth. A flight of twenty-four steps leads down into the pool from the eastern scarp of rock.

The first requisite for the site of the Pool of Bethesda is that it should be possible to have five porches. The only way (as shown by Sir Charles Wilson in his notes to the new edition of the "Bordeaux Pilgrim") in which this requisite could be satisfied is that the pool should be what is called a twin pool, such as that discovered close to the convent of the Sisters of Sion—that is to say, two pools lying side by side, having one portico on each of the four sides thus formed, and one between them on the wall of separation. The discovery of the pool at the church of St. Anne did not at first admit of this possibility. It was, therefore, of interest chiefly as a rediscovery of a mediæval site. But Herr Schick now reports that he has found a continuation of the pool, or rather a sister pool, lying end to end, 60 feet long, and of the same breadth as the first. It is, therefore, possible to make out a reasonably strong case for identifying the newly discovered twin pool with the Pool of Bethesda. (1) It is undoubtedly the pool pointed out by all the writers, from the fourth to the twelfth centuries inclusive, as the Piscina Probatica around which other traditions gathered, as that it was the birthplace of the Virgin Mary. (2) The five porticoes spoken of by the "Bordeaux Pilgrim" as being there in ruins, could very well have stood here. In other words, the historical evidence in favor of this site is as strong as that which connects the Holy Sepulcher with the site adopted by Constantine.

**Carl Pfeiffer.**

We regret sincerely to hear of the death of Mr. Carl Pfeiffer, a distinguished architect of New York, which occurred very suddenly while he was traveling in the South. Mr. Pfeiffer was born in Germany, where he received a very thorough education as an engineer, with which he joined, as is not unusual in Germany, a considerable amount of architectural study. He came to this country about twenty-five years ago, and after some experience in the West, established himself in New York as an architect. He soon gained high distinction, not only for his designs, of which the fine church on the corner of Park Avenue and, we believe, Thirty-fourth Street is an example, but for his skill in interior arrangement, and in heating and ventilating his buildings. His most noted work in this branch of the science of architecture is, perhaps, the church known as Dr. Hall's, on Fifth Avenue, which was described by Captain Douglas Galton, one of the best authorities in the world on the subject, who examined the church with great interest, not only as far superior in warming and ventilation to any European structure of the kind, but as presenting a perfection in these respects which had not even been dreamed of on the other side of the Atlantic. We cannot here attempt to give a list of Mr. Pfeiffer's works, which include, besides, many private houses, hospitals, churches, apartment houses, hotels, and other buildings, but in all of them great thoroughness and ingenuity of construction were added to a very pure taste, both in composition and detail. In his professional life, Mr. Pfeiffer stood among the first for his high-minded enthusiasm for his art, his strictly honorable practice, and his devotion to professional interests. He was one of the earliest members of the American Institute of Architects, and was always active on committees, or in other ways, wherever he could see an opportunity for advancing professional ethics or efficiency. He was one of the first to welcome the idea of a society for mutual defense, as adopted by the French architects, and endeavored to interest his friends in it, long before it was taken up by the great professional societies. Although his health was always delicate, he was an earnest student as well as an active practitioner, and to a profound knowledge of his art he joined a refinement and courtesy which gained for him the highest regard among those who had the pleasure of his acquaintance.—*Amer. Architect.*



**Creosote Wood Preserving Stains.**

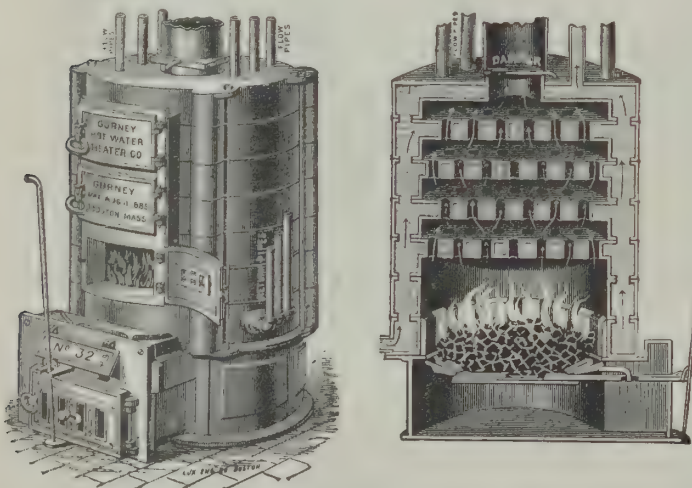
Creosote stains for the coloring of wooden houses have now had almost a decade of trial, and their popularity has grown with every year. Besides their extensive use in this country, they form the only shingle stains ever introduced into England, where their great economy and artistic superiority have met with quick appreciation. It is said that shingles colored with these stains can be positively guaranteed to last fifty years without a vestige of decay, while the permanency of color is also guaranteed to be equal to that of paint. Mr. Samuel Cabot, inventor and manufacturer of these stains, whose office is in the Mason building, Kilby Street, Boston, uses in their preparation only the finest oxides to be found in the English market, and these are ground twice in oil after being imported, preventing the muddy, spotted look on smooth surfaces of wood which is the result of using cheap imitations of these stains. As a primer, to prevent the decay of wood by shutting in its moisture by a coat of paint, nothing has yet been found better than the use of a coat of creosote stain.

**HOUSE HEATING BY HOT WATER CIRCULATION.**

The use of hot water for diffusing artificial heat is no longer an experiment, but is now largely advocated by the leading sanitary and heating engineers in the United States and Canada. The Gurney Hot Water Heater Co., of 287 Franklin Street, Boston, Mass., have now upward of 3,000 of their heaters in use in the United States and Canada, and they are all said to be giving excellent satisfaction. There are many features about the Gurney heater not possessed by any other heater now upon the market, while it is notable for its durability, great economy in fuel, positive and rapid circulation, and open waterways. The accompanying cuts show an elevation and section of the heater, and it will be noted that the water in the heater is coldest at the base, just above the line of the ash pit. At this point bricks are dropped into wedge-like chambers, thus presenting a sufficient amount of water surface to the fire, taking away as much heat as may be done without causing the fire to be dull at the outside edge. By the use of this brick as perfect combustion is secured at the edge of the fire as can be had in any stove. Without this brick the heat taken from the fire by the water would be so great as to largely overcome combustion at the outside edges of the fire pot, which has been the cause in the past of the slowness that has been complained of in hot water heating. The grate is made so as to roll on balls, and it is claimed that, when loaded to its fullest extent, the friction is so far overcome that, by the use of the lever, a child may shake the grate of the largest furnace.

The products of combustion passing from the fireplace strike directly against the bottom surface of the first section above the fire, then, passing through a series of tubes, they strike against the bottom surface of the next section above, where there is a little room left for the expansion of gases. Leaving this chamber, the products of combustion scatter to find an exit at the pipe collar, after striking, successively, five bottom surfaces.

This heater is so constructed as to be easily cleaned by any person without soiling clothing. While shaking the grate, the whole of the doors remain closed, and the grate has a follower which entirely confines the dust to the ash pit. The flues can be entirely cleansed, after a month's constant use, in five minutes, and without risk of injuring clothing, the draught being in, and not out, while the process of cleaning is going on.

**HOUSE HEATING BY HOT WATER CIRCULATION.**

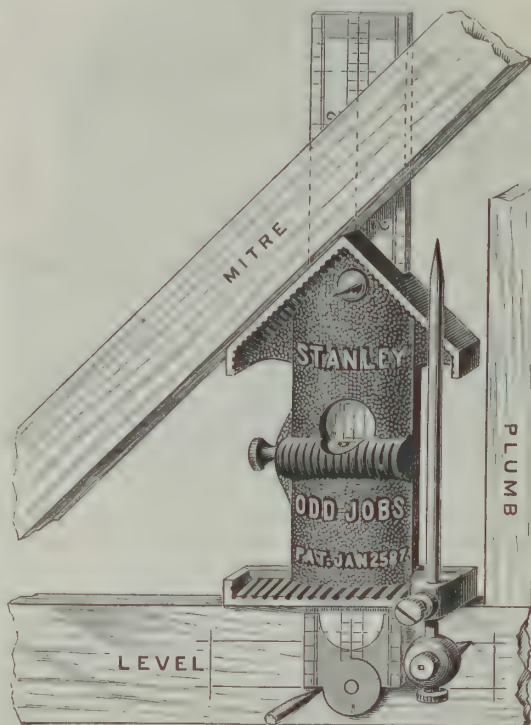
ing the grate, the whole of the doors remain closed, and the grate has a follower which entirely confines the dust to the ash pit. The flues can be entirely cleansed, after a month's constant use, in five minutes, and without risk of injuring clothing, the draught being in, and not out, while the process of cleaning is going on.

THE Mason Regulator Company, of Boston, have recently put upon the market an improved pump pressure regulator, which is especially applicable to pumps used on air brake systems. Over 200 of their reducing valves were used last winter by one car-heating company.

**STANLEY'S "ODD JOBS."**

A small tool, embracing ten distinct and practical uses in carpentry, must be accounted a novelty. This variety of uses is claimed for the article illustrated on this page; and each of its separate uses can be noted by a glance at the illustration.

If the tool is attached to an ordinary carpenter's rule, a try square, or a T square, with long or short tongue,



is made; also, a right or left hand miter square; and the pointed steel rod may be used for a scratch awl.

A marking gauge is made by setting the point, or pencil, at any required distance from the square end of the stock. A mortise gauge, also, by inserting an additional point, or pencil, in the angle at head of the rule. A graduated depth gauge is furnished by extending the rule down from the square end of the stock.

The steel point at mitered end of the tool forms a center, from which a circle can be swung (as with a beam compass)  $1\frac{1}{2}$  to 13 inches in diameter. For small circles, reverse the steel rod, to bring the pencil nearer the center point.

A circle of 25 inches diameter can be swung, if the rule alone is used, with a pencil in the angle at its head.

The tool has just been brought out by the Stanley Rule and Level Company, of New Britain, Conn., and the first indications are that a large sale for them will be found outside of strict carpentry, among many other classes of mechanics, and with amateurs. The hardware dealers have them for sale.

**Ohio's Largest Poplar.**

What is said to have been the largest poplar tree in Ohio went down before the woodman's relentless ax last week to add, if all goes well, to the contents of a capitalist's purse. This monarch of the forest had a traditional age covering several centuries. The oldest inhabitant of Taylorville, near which it stood, could not recall a time when its majestic crown had not outshone those of all the other woodlawn figures, and when it was not looked upon as the patriarch of the forest. A trunk measuring 11 feet 8 inches in diameter proudly supported an upper growth whose topmost point reached a height of more than 240 feet. The hollow at the base widened into a cozy chamber, whose diameter was 7 feet, and whose odd nooks and corners had afforded shelter to generations of prattling children and echoed the sighs of a thousand lovers. No bough projected from its trunk below a height of 60 feet, but from thence upward it spread its majestic shoots in every imaginable direction. Plainly, it was too noble a tree to stand, as the arguments of our times run, and when it was learned that it would yield perhaps 20,000 feet of excellent lumber, of course it had to come down. Some portions of it will be exhibited at the Cincinnati exposition.—*St. Louis Globe-Democrat.*

MESSRS. CHAS. A. STRELINGER & Co., Detroit, Mich., have recently issued a catalogue of nearly 200 octavo pages, descriptive of their tools, supplies, and light machinery for woodworkers, which it would be well for every dealer in tools and builders' hardware to possess, and of advantage also to every workman in this line. The articles described are of the latest and most improved character, and the prices therefor are given in connection with the description, which cannot fail to be an especial convenience, as many of them can be sent by mail at the rate of one cent per ounce.

**Mortar.**

A new idea has been developed in Germany, in the shape of the manufacture of mortar, to be sold at retail to small builders and private individuals. The business requires very little capital, and the mortar, which is mixed by machinery, and of excellent quality, finds a ready sale, something like two million barrels having been disposed of last year in Berlin alone. It is rapidly becoming usual for city builders, here as elsewhere, instead of maintaining large yards, at enormous rents, for the storage of materials, to keep only an office, contracting for their bricks, lime, cement, doors, lumber, glass, and so on, to be delivered at the building where they are to be used. This involves the manufacture of mortar on the ground, under unfavorable circumstances, and at an unnecessary expense; and a provision by which, on dropping a card into a box, or speaking a word through a telephone, a suitable quantity of first-rate mortar for any purpose, ready for use, could be delivered at an hour's notice where required, seems likely to be very useful. We use mortar containing a portion of cement with a freedom unknown abroad, and of course this could not be kept long on hand; but there would be no difficulty in taking the quantity required from a stock of lime mortar, adding the desired dose of cement, and running the mixture through a mill, turning it out in excellent condition. For house-holders, plasterers, carpenters, steam fitters, furnace men, and others who have occasion to use small quantities of mortar or cement, it could easily be supplied in cans or water-tight boxes, and all architects know that mortar honestly made in this way, and kept in stock, would be far superior in quality to that now generally employed in building.—*Amer. Architect.*

**Irrigating Wheels.**

Western people are expert in the construction of labor-saving devices of all kinds, and irrigation is a great feature after one passes Kansas and Nebraska. Journeying from Leadville to Salt Lake City, Utah, immense water wheels are frequently observed in the rivers, driven by the rapidly moving current. These have attached to the outside rim, nearest the land, small buckets, similar in shape to the buckets used in grain elevators. As the immense wheel revolves, these fill with water and empty automatically into a wooden flume at the top, that conducts the liquid to adjacent fields. In this way the farmer obviates the necessity of constructing an expensive ditch two or three miles in length, and lifts his water out of the river and even with the bank, usually from 10 to 14 feet higher than the top of the running stream. No oil and no attention are required. It works on, solitary and alone, day and night, and probably dies of old age if no repairs are made and no freshets sweep it out of existence.

**LIQUID FISH GLUE.**

Few persons have any idea of the growth of this line of manufactured glue, which was perfected and patented by Wm. N. Le Page, who, in 1886, made many important improvements, and the glue now manufactured under his process is clearer, stronger, more flexible, and consequently more tenacious than the first made. It is not susceptible to moisture and does not dry up in the package, but dries quickly when applied to the work.

This glue is invaluable in all branches, and the Le Page Liquid Glue and Cement Co., of Gloucester, Mass., is to be congratulated on the location of their office and works at Fort Point, as it comprises the wharf and commodious buildings lately occupied by George J. Tarr & Co., extensive manufacturers of cod liver oil.

This gives them the advantage of water communication the year round, which is an important item when railroad freight rates are considered, and the excellence of the location gives them great advantages in obtaining material, as well as in shipping their goods.

The accompanying cut represents a new can which Mr. Le Page has invented, and in which the company are sending out their glue. As indicated, the brush is attached to the screw top, through which it passes and is fastened to the handle above. The advantages of this construction are that a form of handle is given that can be firmly grasped, the brush is always at hand ready for use, while when not in use the can is tightly covered and the contents kept in good condition.

The fact that the sale of fish glue, which was first manufactured in its improved form by Mr. Le Page within the last twelve years, now reaches millions of bottles each year shows in what estimation it is held by the public, and there are few stores in existence that keep any glue in stock where Le Page's is not the favorite, and the one universally called for.





## F. W. DEVOE & CO.

(Established 1852)

### PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made only of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS.**

ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.

Catalogues of our different departments to responsible parties.

Cor. Fulton and  
William Sts.,  
NEW YORK.

Coffin, Devoe & Co.,  
176 Randolph St.,  
CHICAGO.

## DEXTER BROTHERS' ENGLISH SHINGLE STAINS



Are made of the very best English Ground Colors, and contain no benzine, water, or creosote. They have been thoroughly tested by some of the best Architects in the country during the past three or four years, and the colors are more lasting than any other stain. The price is 75 cents a gallon for any color. We would advise Architects to specify Dexter Brothers' English Shingle Stain, and note the number on the Sample boards. Send for Sample Boards of Colors. DEXTER BROTHERS, 55 and 57 Broad Street, Boston, Mass.

Send for copy of Memoranda  
of Specifications.

## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

MURPHY & COMPANY,  
227 BROADWAY,  
New York City.

## THE ECONOMY COMBINATION

Steam and Warm Air Heater

—AND THE—

Economy Warm Air Furnaces

ARE PERFECTLY ADAPTED TO

Warming Churches, Schools, Residences, &c.

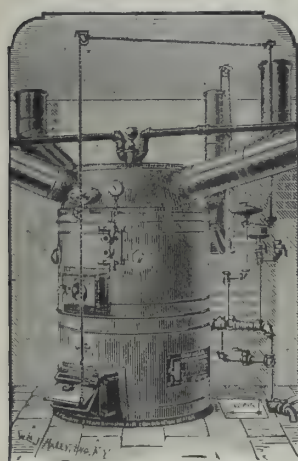
THEY ARE GUARANTEED DURABLE AND ECONOMICAL.

Send for our Catalogue, giving full particulars, descriptions, and illustrations of 31 different styles and sizes of Heating Apparatus.

MANUFACTURED SOLELY BY THE

**J. F. PEASE FURNACE CO.**

SYRACUSE, N. Y., AND TORONTO, ONT.



The Combination Heater.

Eastern Agents.—EARL B. CHACE & Co., 206 Water St., New York; JOHN DEMAREST, General New England Agent, 75 Union St., Boston; W. H. FENNER & Co., Providence.

Western Agents.—ADKINS & HOFFMAN, 177 East Randolph St., Chicago, Ill.; GOSS HEATING AND PLUMBING CO., 703 Main St., Kansas City, Mo.; ARTHUR A. POND, 35 Washington Ave. South, Minneapolis, Minn.; GAGE & HORTON MFG. CO., 1231 Olive St., St. Louis, Mo.

## New Combination Dividers.

Forming Dividers with short and long extension points (pencil may be used in connection with either), Outside Calipers, Inside Calipers and Hermaphrodite Calipers.

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard tough, strong, and finely finished.

The joint is large and firm. The quadrant is round and fastened by an improved method. The steel points are tempered by a process which leaves them hard and tough. On the threaded end of the quadrant, between the adjustable legs, is a knurled nut, against the inside of which a helical spring acts. After the points are adjusted the nut may be turned back against the leg, LOCKING IT FIRMLY.

A common pencil fits either socketed leg, while an auxiliary holder is also furnished to fit reversed end of either point. This is one of the most useful combinations of the kind, as well as the BEST MADE tool ever produced.

Send Stamp for Illustrated Price List of Fine Tools for Mechanics.

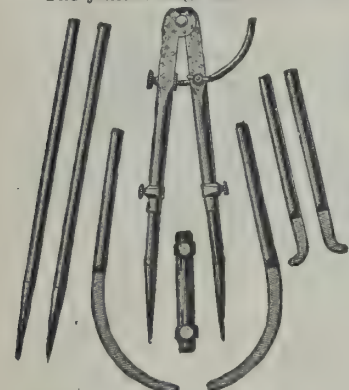
**L. S. STARRETT,**

MANUFACTURER OF

Combination Squares, Caliper Squares, Bevel Protractors, Thread Gauges, Steel Rules, Surface Gauges, Scratch Gauges, &c., &c.

Full Line of Callipers and Dividers, best on the market.

**ATHOL, MASS.**



STARRETT'S NEW COMBINATION DIVIDERS.

## Architects, Builders, and House Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call

Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken,

leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

GENERAL OFFICES:

No. 708 PENN AVENUE, PITTSBURGH, PA.

Branch Offices:

Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
139 East Madison Street, Chicago. F. E. Dehenhardt, Manager.

MANUFACTURERS OF

The **WARING ANTI-INDUCTION** and **BUNCHED CABLES**, and **ACHESON COMPOUND CABLE.**

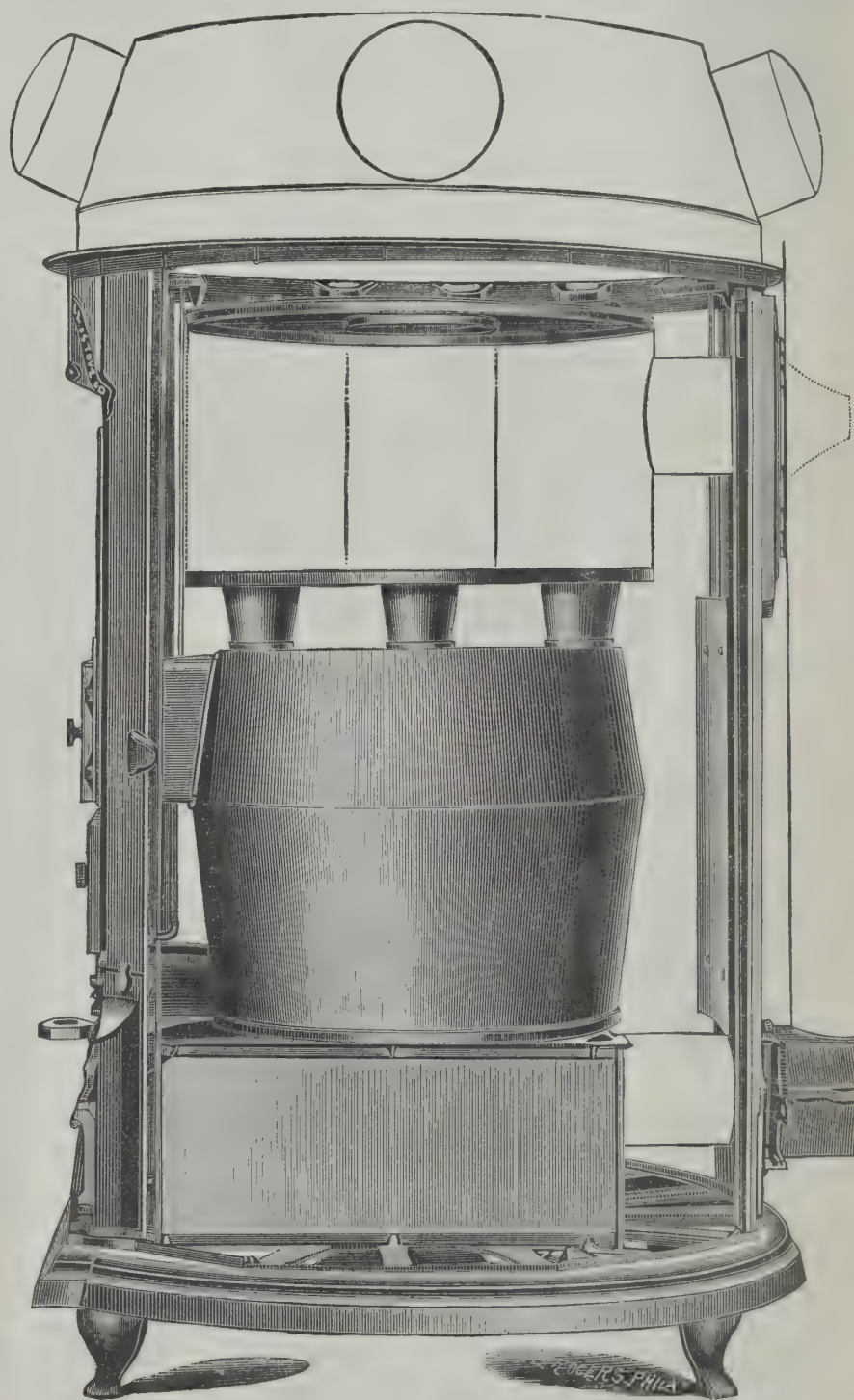
For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial.

**Light Leaded Cables** (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.

**Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.**

All Work Guaranteed.

Send for Illustrated Circular.



**Solar Iron Clad.**

This is a Cast Iron Casing, lined with tin or galvanized iron, to prevent direct radiation of heat in cellar; four loose panels lift out, so as to give access to furnace for repairs or renewal, if necessary, without disturbing the Hot Air Pipes; it has sliding panels for feed door and smoke pipe to allow for expansion; it has also a dust flue and flue door for Damper. We claim this to be the most complete, durable, and convenient cold case made, equal in efficiency to Brick set, with much less room required and less expensive, besides the facility for access for repairs, without requiring, as in a brick set, so large a space to work in. It is much superior to the ordinary sheet iron casing, both for durability and efficiency. It is not necessary to remove the casing or Hot Air Pipe to clean out, or repair, or even renew or change the heater.

**The Leibbrandt & McDowell Stove Co.,**  
**PHILADELPHIA and BALTIMORE.**




**MORSE ELEVATOR WORKS.**  
Morse, Williams & Co.  
(Successors to Clem & Morse)  
Builders of all kinds of  
**PASSENGER & FREIGHT**  
**Elevators**  
Office, 411 Cherry St.  
Works, Frankford Ave., Wilkey and  
Shackamaxon Sts.  
**PHILADELPHIA.**  
New York Office, 108 Liberty St.



Telephone Call,  
360 Pearl.

**HENRY H. HILL**  
36 Pearl Street,  
**NEW YORK,**  
MANUFACTURER OF  
**ELEVATORS**  
—FOR—  
Factories, Stores, Warehouses,  
Stables, etc., operated by  
Steam, Hydraulic, Belt, and  
Hand Power.  
Shafting, Hangers, Pulleys,  
etc.

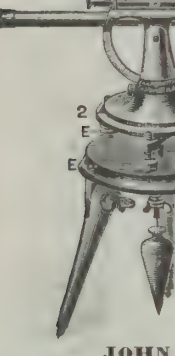


**M. B. SWEZEY,**  
MANUFACTURER OF  
**Improved Dumb Waiters**  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
**CHICAGO, ILL.**  
120 Twentieth Street,



The latest im-  
proved, i. e., the  
boss to Engineers,  
Architects, Build-  
ers, Contractors,  
Farmers, and all  
others requiring a  
low price Levelling  
Instrument for  
grading, measuring  
heights, squaring,  
or getting any de-  
sired angle. Des-  
criptive circulars  
furnished on re-  
ceipt of stamp.

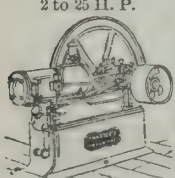
**JOHN W. HARMON,**  
65 Haverhill Street, Boston, Mass.




**The Great Church LIGHT.**  
FRINK'S Patent Reflectors give  
the Most Powerful, the Softest,  
Cheapest and the Best Light known  
for Churches, Stores, Show Windows,  
Parlors, Banks, Offices, Picture Gall-  
eries, Theatres, Depots, etc. New and ele-  
gant designs. Send size of room. Get  
circular and estimate. A liberal discount  
to churches and the trade.  
I. P. FRINK, 551 Pearl St., N. Y.



**CHARTER'S GAS ENGINE.**  
2 to 25 H. P.  
The Simplest, most Reliable, and  
Economical Gas Engine  
in existence.  
An Impulse at every revolution.  
Perfect steadiness guaranteed  
for Arc or Incandescent Electric  
Lights.  
Independent of gas works when  
desired, and makes its own  
gas at a cost of 65 cents per  
M. feet, or about one cent per  
hour to each indicated H. P.  
A Perfectly Safe Motor  
for All Places and Purposes.  
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.  
**Williams & Orton Mfg. Co.**  
**P. O. Box 148. STERLING, ILL.**



SEALING  
BRASS  
COPPER TUBES  
SHEET BRASS BRASSWORK  
FOR  
DRIVE SHAFTS, PIN JOINTS, ETC.  
175 N. LAKE ST.  
CHICAGO.  
Mention this paper.



**GURNEY HOT-WATER HEATER**  
Is the most Powerful and Economical for Heating  
Dwelling Houses, Public Buildings,  
School and Green Houses, Churches, etc.  
BY  
**HOT-WATER CIRCULATION.**  
Has never been equalled and saves 25 per  
cent. in fuel and does not require half atten-  
tion of other heaters. Gold Medal, Boston.  
Highest Award, New York. "The Heater  
of the Age." Over 3,000 now in use.  
MANUFACTURED BY  
**GURNEY HOT-WATER HEATER CO.**  
Office and Showroom, 237 Franklin Street, Boston, Mass.  
WORKS AT EAST BOSTON.  
Selling Agencies.—M. H. Johnson, 140 Centre St., N. Y.; Rice & Whitacre  
Mfg. Co., 42 and 44 W. Monroe St., Chicago, Ill.; T. R. Chase, 31 Edmund Place,  
Detroit, Mich.; William Gardiner & Co., Portland, Oregon; J. L. Friable, 526  
Phila. St., Covington, Ky.; Valk & Murdoch, Charleston, S. C. IT PAYS TO DO WORK EARLY. Mention this paper




**STRIKES!**  
In anticipation of the now general strikes in Western  
Rolling Mills, we have accumulated over 2,000 tons of sheets  
of our regular sizes. Remember this if you want orders  
executed promptly, with first-class Plain or Corrugated  
Metallic Roofing, Siding, Ceiling, Arches, Lath, etc.  
**THE CINCINNATI CORRUGATING CO.,**  
CINCINNATI, OHIO.

**HENRY S. NORTHROP.**  
Corner Centre & Franklin St. New York, N.Y.  
**PANELED SHEET IRON CEILING**  
FIRE PROOF, ORNAMENTAL, DURABLE, QUICKLY PUT UP.  
SUITABLE FOR ALL CLASSES OF BUILDINGS.  
CAP SEAM AND CRIMPED IRON ROOFINGS.



**FOOT-POWER MACHINERY.**  
COMPLETE OUTFITS FOR CONTRACTORS AND BUILDERS.  
Machines for ripping, cross-cutting, scroll-sawing, mortising and  
tenoning, forming edges, grooving, gaining, rabbeting, cutting  
dados, and turning. Builders use our Hand Circular Rip Saw for  
the greater portion of their ripping in preference to carting their  
lumber to a mill five minutes' drive from their shops. The same  
is true in regard to scroll sawing, mortising, tenoning, cutting stuff  
for drawers boxes, etc. Builders using these machines can bid  
lower and save more money from their contracts than by any  
other means.  
**Read the Following Letters from Builders:**  
CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your  
Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the  
ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped  
as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs  
and saved all drips for 200 windows."  
ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers  
to make for a drug store; the steam power mill wanted 50 cents each for making them.  
With my foot power machinery I made them, and saved \$25 above good wages on the job.  
If desired, these machines will be sold ON TRIAL.  
The purchaser can have ample time to test them in his own shop and on the work  
he wishes them to do. Descriptive Catalogue and Price List Free.  
W. F. & JOHN BARNES CO., No. 567 Ruby St., Rockford, Ill.



**CHAS. E. LITTLE, 59 FULTON ST.**  
New York.  
Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for  
**W. F. & J. Barnes' Workshop MACHINERY.**  
New York Agency. Factory Prices.

**Patent Foot Power Machinery!**  
The Latest and Most Improved  
Scroll Saws, Circular Saws,  
Lathes, Mortisers, Etc.  
**THE "ACME" CIRCULAR SAW.**  
For Foot or Hand Power.  
Suitable for various kinds of work, in  
Cutting-off, Ripping, Mitring, Rabbeting,  
and Grooving, and with the addition of the  
extra attachments, Scroll Sawing, Boring,  
etc.  
Price, with two 7-inch Saws, \$40.  
"Diamond" Mortising Machine.  
Will mortise 1/4 to 1 inch wide, 3 inches  
deep, and with the addition of the Diamond  
Adjustable Tenoning Tool, cut  
Tenons 1/8 to 3/4 in. thick,  
3 in. wide.  
Price, with 3 chisels,  
\$25.  
Machines on Trial.  
Catalogue Free.  
**Seneca Falls Mfg. Co.,** 276 Water Street,  
SENECA FALLS, N. Y.



**THE NEW YORK SELF-RUNNING SHADE ROLLER**  
THE BEST ON THE MARKET  
MADE IN KIDNEYWOOD  
EVENY ROLLER  
WARRANTED  
MANUFACTURED BY  
**CUSHMAN BROS. & CO.,**  
BOSTON, MASS.  
All Shades and Upholstery Goods at  
Bottom Prices.



**AUGER BITS.**  
Square, Oval, Round,  
Smooth Boring, for fine  
carpenter, cabinet, and  
pattern work. 1/4 in. bit  
50c.; set of five, 4 to 8-8  
in. \$4.00, free with list,  
by mail, receipt of  
price. BRIDGEPORT  
GUN IMPLEMENT  
CO., 17 Maiden Lane,  
New York.

**E. & H. T. ANTHONY & CO.,**  
591 Broadway, N. Y.  
Manufacturers and Importers of  
**PHOTOGRAPHIC**  
**INSTRUMENTS,**  
Apparatus and Supplies,  
OF EVERY DESCRIPTION.  
Sole Proprietors of the Patent  
Detective, Fairy, Novel, and  
Bicycle Cameras, and the Cele-  
brated Stanley Dry Plates.  
Amateur Outfits in great vari-  
ety from \$9.00 upward. Send for  
Catalogue or call and examine.  
More than Forty Years Estab-  
lished in this line of business.

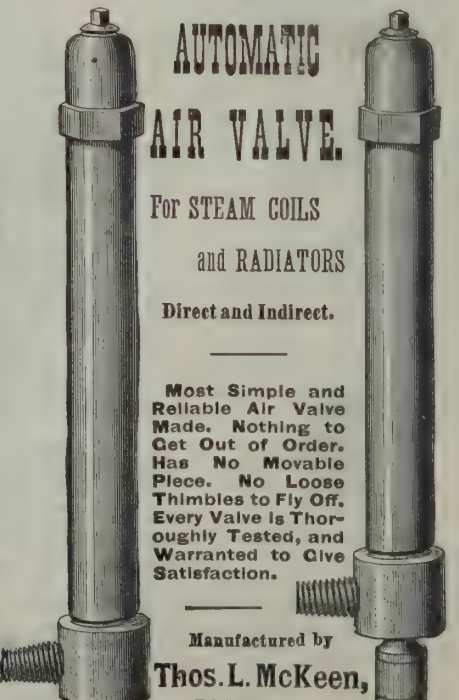


ESTABLISHED 1854.  
**DEVINE'S STEAM BOILER WORKS,**  
Marine, Locomotive, Tubular, House, and  
**GREENHOUSE BOILERS.**  
WROUGHT IRON HOT WATER BOILERS  
A SPECIALTY.  
Manufactory, 381 to 393 S. Canal Street, Chicago.

**PETER DEVINE,**  
387 S. CANAL ST., CHICAGO.  
The above cut is of Greenhouse Boiler, meeting  
with universal success wherever placed. Estimates  
gladly furnished for any capacity.



**AUTOMATIC AIR VALVE.**  
For STEAM COILS  
and RADIATORS  
Direct and Indirect.  
Most Simple and  
Reliable Air Valve  
Made. Nothing to  
Get Out of Order.  
Has No Movable  
Piece. No Loose  
Thimbles to Fly Off.  
Every Valve is Thor-  
oughly Tested, and  
Warranted to Give  
Satisfaction.  
Manufactured by  
**Thos. L. McKeen,**  
EASTON, PA.





# OIL WELL SUPPLY CO., Limited.

PITTSBURGH, PA.,  
OIL CITY, PA., and  
BRADFORD, PA.

MANUFACTURE AND SELL ALL KINDS OF

## Tools and Machinery

BOILERS, ENGINES, TUBING, CASING and ROPE

FOR

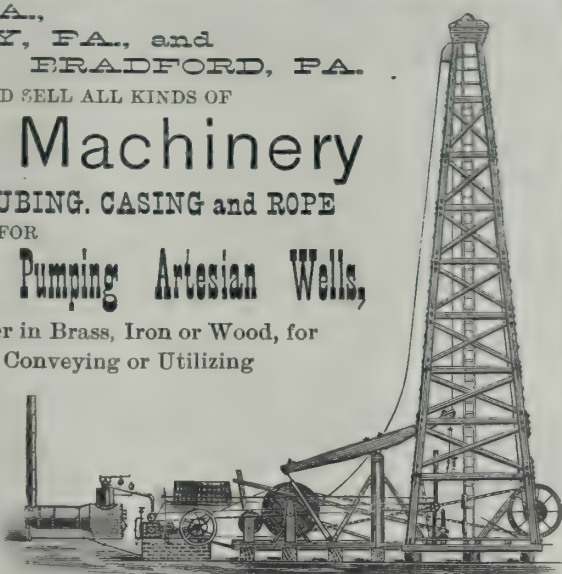
## Drilling, Equipping, and Pumping Artesian Wells,

And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,

NATURAL GAS,

WATER, or STEAM.



## IMPORTANT

To Architects, Builders, House-Painters, Decorators, Boat-Builders  
and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Var-  
nishes or Wood-Finishes in  
the market, for the follow-  
ing reasons, viz.:

They possess more  
body, higher luster,  
greater resisting pro-  
perties to atmospheric  
influences, action of  
water and alkali, are  
more elastic, will not  
scratch or mar white,  
and are more durable.

### WORKS:

734-740 East 14th Street,  
733-739 East 13th Street,  
199-207 Avenue D.

## STANDARD VARNISH WORKS,

## D. ROSENBERG & SONS,

Office, 207 Avenue D,

NEW YORK.

Send for Samples and Full Particulars.



For all classes

Inside Work,

Requiring great dura-  
bility, use No. 2 ELAS-  
TICA FINISH.

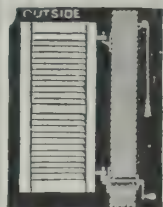
For

Outside Work,

Requiring extreme  
durability, use No. 1  
ELASTICA FINISH.

Manufactured by

# MALLORY'S STANDARD SHUTTER WORKER



Opens and closes the blinds without raising the window.

Automatically locks the blinds in any position.

Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

Can be applied to old or new houses, of brick, stone, or wood.

AGENTS WANTED.

Send for Illustrated Catalogue to

Frank B. Mallory,

FLEMINGTON, NEW JERSEY, or  
60 LIBERTY STREET, NEW YORK.

ESTABLISHED 1844.

## SAMUEL H. FRENCH & CO.,

York Avenue, Fourth and Callowhill Sts.,

PHILADELPHIA, PA.

## PAINT MANUFACTURERS.

Strictly Pure Lead, Zinc and Colors, Dry, in Oil, Japan,  
and Ready Mixed for Use.

# PEERLESS MORTAR COLORS.

BLACK, BROWN, BUFF, AND RED.

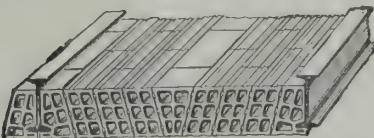
Masons' and Builders' Supplies.

SEND FOR CATALOGUE AND CIRCULARS.

## TOCH BROTHERS

—ALSO—

Paints,  
Varnishes,  
Brushes,  
Stains,  
Etc.



(Iron Beam Protection. Patented June 3, 1884.)  
**HENRY MAURER & SON,**  
MANUFACTURERS OF  
**FIRE-PROOF MATERIAL**

Of every description. Hollow Brick made of Clay for  
Flat Arches, Partitions, Furring, etc. Porous  
Terra Cotta, Fire Bricks, etc., etc.

Office and Depot, 420 East 23d St., New York.  
WORKS, PERTH AMBOY, N. J.



**Fine Office & Bank  
Fittings** BRASS &  
WIRE WORK.

A. H. ANDREWS & CO. 195 Wabash  
Ave., Chicago, and 686 Broadway, N. Y.



## MANUFACTURER OF ARTISTIC SLATE MANTELS

Grates, Fire Place Adjuncts.

Importer of TILES for all purposes.

CHAS. B. KLINE, 331 N. 4th St., Phila.

Send stamp for illustrated design sheet.

### THE "IDEAL"

PATENT TILE-LINED BATH-TUB.

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,

BAKER BUILDING,

1524 CHESTNUT ST., PHILADELPHI

Send for Illustrated Circular and References.



## MAXWELL'S Gypsum Paint

For Whitening and Coloring  
Churches, Factories, Mills, Dwell-  
ings, Barns, Fences, or for any  
purpose where whitewash or kal-  
somin is used. Made in a va-  
riety of standard colors. Put up  
in 1/2 and one gallon, also 1/4, 1/8,  
and one barrel quantities.

A Beautiful, Durable, and  
Cheap article.

Will stand any climate.

MANUFACTURED BY

JOHN MAXWELL,  
1603 OTSEGO STREET,  
PHILADELPHIA.

Mention this  
Paper.



## HOMES

OF  
TO-DAY

Or, MODERN  
EXAMPLES OF  
MODERATE  
COST

HOUSES

Published in one annual and three quarterly parts.  
Annual part now ready, 96 large quarto pages, 30  
designs of buildings costing \$250 to \$12,000;  
nearly 200 illustrations; colored frontispiece, and full  
set framing plans and details of country house. A  
complete hand-book for those intending to build.  
Price, Annual Part, 50c. Each Quarterly  
Part, 25c. The four parts postpaid, \$1.00.  
F. L. SMITH, Architect, 22 School St., BOSTON.



## COSY HOMES!

How to Build Them.

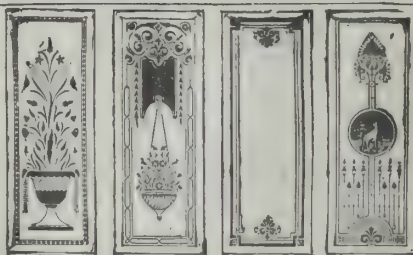
Contains 96 pages, showing  
complete designs of 10 low-  
cost houses, with valuable  
information for those who  
wish to build economically.

The book will be mailed,

post-paid, on receipt of Price, 25 Cents. Postal

note, or 1 and 2 ct. stamps.

F. L. SMITH, Architect, 22 Scho 1 St., BOSTON.



EDWIN LEE BROWN, Pres't.  
**The Western Sand Blast Co.,**  
Ornamenters of Glass for  
**VESTIBULE DOORS,  
TRANSOMS,  
BANK & OFFICE COUNTERS,**  
Manufacturers of Advertising  
Glass Signs.  
Sand Blast & Embossed Rail-  
road Glass a specialty.  
N. W. Cor. Clinton & Jackson Sts.,  
CHICAGO, ILL.  
Telephone 4085.



# THORN SHINGLE & ORNAMENT CO.,

SOLE MANUFACTURERS OF

The Best and Cheapest Metallic Roofing

## TILES AND SHINGLES

YET OFFERED TO THE BUILDING TRADE.

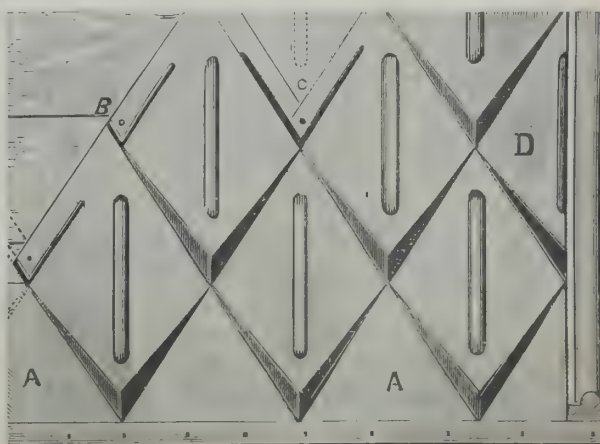
The Horseshoe Spring-Lock Shingle (Patten's Patent) just out. This Shingle can be put on in one-half the time it requires with  
any other shingle now in the market. Is cheap, durable, secure, thoroughly water-tight and makes a good appearance as a roof  
covering. Two (2) sizes.

THORN'S PATENT ROOFING and WALL TILES, the most perfect and Unique Roof, Gable, Tower, and Wall covering,  
cotta earthen tiles, and are better, and half the cost. Four (4) designs or sizes are made.  
All the above goods are packed a square to the box and delivered f. o. b. cars in Philadelphia.

For particulars, price lists, etc., address

THORN SHINGLE & ORNAMENT CO.

12th & Callowhill Streets, Philadelphia, Pa.





**Dearborn St.,  
Chicago.**



THE LATEST & BEST IMPROVED

# BRICK MACHINES

FOR BOTH STEAM AND HORSE POWER.



WRIGHT 7000 LBS. WEIGHT 7200 LBS.

STEAM POWER BRICK MACHINE WITHOUT GEARING. STEAM POWER BRICK MACHINE READY FOR PULLEY.



SEND FOR ILLUSTRATED CATALOGUE

## HENRY MARTIN,

INVENTOR, PROPRIETOR, AND MANUFACTURER.

139 CHESTNUT ST. LANCASTER, PA., U.S.A.

HORSE POWER BRICK MACHINE.

## GIBBS' ENGLISH PORTLAND CEMENT

Is unrivalled for quality and Cheapest to use.

## INGHAM'S ENAMELED BRICKS

Are beautiful for Decoration and Interior Finish. Send for Catalogue, etc., of Novelties.

HOWARD FLEMING, 23 Liberty St., New York.

ESTABLISHED 26 YEARS

30% SAVED IN COST

REBELRA

MOBILIA STAINS



WILL NOT FADE OR RUN

TRADE MARK

—Send for Circular E.—

MANUFACTURED ONLY BY S. BOWEN'S SONS, 150 NTH. 4TH. ST. PHILADELPHIA, PA. U.S.A.

## PASSENGER ELEVATORS,

MANUFACTURED BY

HOWARD IRON WORKS,  
BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

## GRAVES' ELEVATORS, PASSENGER and FREIGHT,

MANUFACTURED BY

L. S. GRAVES & SON, Rochester, N. Y.

BRANCH OFFICE: 46 Cortlandt Street, New York.

## THE WELLS PROCESS

Rustless Oxide of Iron.

The Newest and Best Process

FOR

PROTECTING IRON.

Special and Exclusive Rights For Sale

RUSTLESS IRON WATER PIPE

SEND FOR CATALOGUE

THE WELLS RUSTLESS IRON CO.

STREET NEW YORK

## Cast Iron Gas and Water Pipes

1½ to 48 INCHES DIAMETER.

Cast Iron Flange Heating and Steam Pipes, Fire Hydrants and Stop Valves for Water or Gas, all Sizes.

ALL PIPE PROVED BY HYDROSTATIC PRESSURE.

## GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.

SAMUEL R. SHIPLEY, Prest.  
HENRY B. CHEW, Treas.

OFFICE,

JAMES P. MICHELLON, Secy.  
WILLIAM SEXTON, Supt.

6 North Seventh Street, Philadelphia.



## Mineral Wool

FOR

FIRE-PROOFING,

DEADENING SOUND,

and INSULATION of HEAT

and COLD in

RESIDENCES,

COLD STORAGE, and

REFRIGERATING ROOMS.

Descriptive Pamphlet and Sample Free.

ADDRESS:

Western Mineral Wool Co.,

Cleveland, O.

St. Louis, Mo.

## ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

To Architects,  
Builders,  
and Owners.

Attention is called to Fireproof and Vermin Proof

## MINERAL WOOL

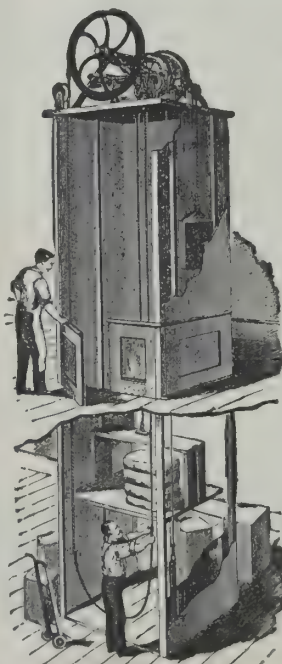
As a Lining in Walls and Floors for preventing the Escape of Warmth and the Deadenng of Sound.

Sample and Circular Free.

U. S. Mineral Wool Co., 2 Cortlandt Street, N. Y.

## THE HUMPHREY PONY HAND ELEVATOR.

(Patent Applied for.)



For light Store and Factory work, Hospitals and Public Buildings. For Trunk and Invalid lifts. For carrying Coal, Flour, Ashes and other heavy substances in Tenements, Flats and Private Dwellings.

So simple in construction, and price so low that it can be used in many places instead of a dumb waiter, and has many times the lifting capacity.

Capacity 500 pounds. Price of fixtures, \$36 per set.

We are also manufacturers of the New York Safety Dumb Waiter fixtures, the most complete, simple and absolutely safe Dumb Waiter fixtures ever made.

Send for Descriptive Catalogue.

THE EDWARD STORM SPRING CO., Limited,  
Poughkeepsie, N. Y.

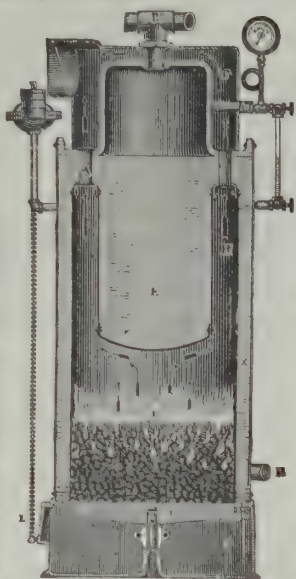
or JOHN H. GRAHAM & CO., Sole Mfrs.' Agents,  
113 Chambers Street, New York.



## Duplex Steam-Heater Co.

Manufacturers under FISKE'S PATENTS,  
10 Barclay Street, New York.

Simplest in Construction.  
Largest Steaming Capacity.  
WRITE FOR REFERENCES AND DISCOUNT.



AGENTS WANTED EVERYWHERE.  
Send for Illustrated Catalogue and Price-List.

## Superior Copper Weather Vanes

GILDED WITH PURE GOLD.  
TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.



Vanes made from any  
Drawing or Design on  
Short Notice.

**T. W. JONES,**  
SUCCESSOR TO  
**CHAS. C. BIGGS,**  
**V. W. BALDWIN,**  
Removed from 213 Pearl  
Street to  
**170 & 172 Front St.,**  
Near Maiden Lane,  
**NEW YORK.**

Illustrated catalogue of over 250 designs, mailed  
to any address on receipt of a two cent stamp,  
half the postage.

## FOUNDRY PRACTICE, Moulders' Text Books, etc.

**American Foundry Practice.**—Treating of Loam, Dry Sand and Green Sand Moulding, and containing a Practical Treatise upon the Management of Cupolas and the Melting of Iron. By Thomas D. West, practical Iron Moulder and Foundry Foreman. Fully illustrated. Sixth Edition. 12mo, cloth. \$2.50.

"One hundred items that apprentices should know and remember alone are worth the price of the whole work."—*American Machinist.*

**Moulder's Text Book, being Part II. of American Foundry Practice.**—A Practical Treatise on Moulding, discussing the question of economy in casting and the arrangement of a foundry in regard to rapid work. Treating of Cupolas, Methods of Firing, Best Means of Securing Perfect and Sound Castings, etc., being a continuation of Vol. I. on this subject, and dealing with a class of work requiring more skill and greater care. By Thomas D. West. With numerous illustrations. Third edition. 12mo, cloth. \$2.50.

"The title page gives but an imperfect idea of the thorough manner in which the topics of the work are handled, or of its genuine excellence and utility."—*Mechanical News.*

**Iron and Steel.**—The Ores of Iron, Methods of Reduction, Manufacturing Processes, Chemical and Physical Properties of Iron and Steel, Strength, Ductility, Elasticity, and Resistance, Effects of Time, Temperature and Repeated Strain, Methods of Test, Specifications. By Prof. Robert H. Thurston, Cornell University. 8vo, cloth. \$4.00.

"Should be in the hands not only of all engineers, but of all mine owners and metallurgists as well."—*Mining Review.*

**The Alloys and Their Constituents.**—Copper, Tin, Zinc, Lead, Antimony, Bismuth, Nickel, Aluminum, etc. The Brasses, Bronzes, Copper-Tin-Zinc Alloys, other Valuable Alloys, their Qualities, Peculiar Characteristics, Uses and Special Adaptations. Thurston's "Maximum Alloys." Strength of the Alloys as Commonly Made, and as Affected by Special Conditions, the Mechanical Treatment of Metals. By Robert H. Thurston, Cornell University. 8vo, cloth. \$3.00.

"The volume before us contains information not readily obtainable elsewhere, and of direct practical value, not only to the engineer, but to the manufacturer and worker in metals and alloys."—*American Machinist.*

**Notes on the Chemistry of Iron.**—By Magnus Troilius, of Medvale Steel Co., Pa. Illustrated. New edition, revised. 8vo, cloth. \$2.00.

**Iron Smelters' Pocket Analysis Book.**—Containing Tables and Blanks for Analysis of Ores. By Thomas Whitwell. Oblong. Morocco. \$2.00.

**The Practice of Ore Dressing in Europe.**—By W. B. Kunhardt, Mining Engineer. 8vo, cloth. \$1.50.

**The Calculations of Strength and Dimensions of Iron and Steel Constructions.**—With reference to the latest experiments. By Prof. J. J. Weyrauch, Polytechnic Institute of Stuttgart. Translated by A. J. DuBois. With plates. 8vo, cloth. \$1.50.

"No engineer or architect can afford to ignore these experiments and the resulting formulae based upon them."

Mailed and prepaid on receipt of price. Catalogues gratis.

**JOHN WILEY & SONS,**  
15 Astor Place, New York City.

## The Great Architect.

## H. H. RICHARDSON AND HIS WORKS.

By Mrs. SCHUYLER VAN RENSSELAER.

With a fine portrait of Mr. Richardson, twenty-six full-page Heliotypes, and over seventy other sketches, full-page and smaller, illustrating Mr. Richardson's works. *The edition is limited to 500 copies.* In a quarto volume, attractively bound. \$20.00.

Mrs. Schuyler Van Rensselaer's great monograph, *Henry Hobson Richardson and His Works*, is one of the most beautiful art books ever attempted in this country, and has the special merit of being American in spirit and substance, in matter and manner, in its genius and in workmanship. In form it is a folio, the page being twelve inches wide by fifteen in height. There are ix and 152 pages of text, thirty-seven full-page illustrations, and nearly double that number in the text. Almost all the full-page illustrations are beautiful heliotypes, making a really splendid gallery of Mr. Richardson's principal works. Whether it would have been possible to find a better biographer for Mr. Richardson than Mrs. Van Rensselaer it is not easy to determine. It is manifest, however, that her work is adequate and satisfying—an extraordinary achievement, which will add to Mrs. Van Rensselaer's fame and give great pleasure to Mr. Richardson's admirers in the profession.—*Boston Beacon.*

## Building and Buildings.

**BUILDING CONTRACTS, LEASES, EASEMENTS, AND LIENS.** By A. PARLETT LLOYD, Esq., of the Baltimore bar, author of "The Law of Divorce." 1 vol. 8vo, cloth, \$4.50; law sheep, \$5.00.

This is the first adequate American treatise ever published on the Law of Building. Mr. Lloyd has made a careful and exhaustive study of the subject, and his work contains reference to and citations from every important English and American case upon matters relating to building. It is a plain, clear statement of the law as enacted by legislation and decided by the courts, and is a work of great value to builders.

\*For sale by all Booksellers. Sent by mail, postpaid, on receipt of price by the Publishers.

**HOUGHTON, MIFFLIN & CO., Boston,**  
11 East Seventeenth Street, New York.

## Notes and Queries.

(1) J. A. H. asks the component parts of a cement that will mend terra cotta pipe so it will resist moisture. A. We know of nothing better than pure Portland cement. If a stronger and harder cement is required, a little water glass or soluble silica is mixed with the cement and quickly used, as it soon sets.

(2) A. F. M. desires a receipt for taking the rust off drawing instruments without injuring them. A. Mix 10 parts of tin putty, 8 of prepared buck's horn, and 25 of spirits of wine, to a paste. Cleanse the articles with this, and finally rub with soft blotting paper.

(3) N. P. K. asks how to polish black marble. A. The process embraces five stages, beginning with the use of coarse materials and finishing with dry rags. A full description of it is given in Spon's "Workshop Receipts," first series, in an article entitled "Marble Working." We can supply the book for \$2.

(4) J. H. N. asks how to make a varnish of bleached shellac to be used in the place of the common shellac dissolved in alcohol. A. Break the gum in small pieces, and macerate in a stoppered bottle with ether; after swelling up sufficiently the excess of ether is poured off, and it will readily dissolve in alcohol.

## THE TIFFANY GLASS COMPANY

MEMORIAL WINDOWS  
GLASS WORK DECORATIONS  
*Designs and Estimates submitted.*

333-335 Fourth Ave., New York City.

## J. B. LIPPINCOTT COMPANY'S

## New Books FOR Summer Reading

### BRUETON'S BAYOU and MISS DEFARGE.

No. 2 of the new series of "American Novels." By JOHN HABBERTON, author of "Helen's Babies," and FRANCES HODGSON BURNETT, author of "That Lass o' Lowrie's." Complete in One Volume. Square 12mo. Extra cloth. \$1.00. Paper. 50 cents.

### THE DESERTER and FROM THE RANKS.

No. 1 of the new series of "American Novels." By CAPT. CHARLES KING, author of "The Colonel's Daughter," "Marion's Faith," etc. Square 12mo. Extra cloth. \$1.00. Paper. 50 cents.

### DAPHNE.

A Novel. By "Rita," author of "Vivienne," "Like Dian's Kiss," etc. No. 86 of Lippincott's Series of Select Novels. Half cloth. 50 cents. Paper. 25 cents.

### TAKEN BY SIEGE.

A keenly interesting story. Handsomely issued in 12mo form. Attractive binding. Extra cloth. \$1.25.

### A NEW "DUCHESS" NOVEL.

THE HONOURABLE MRS. VEREKER. By the author of "Marvel," "A Modern Circe," etc. No. 87 of Lippincott's Series of Select Novels. Half cloth. 50 cents. Paper. 25 cents.

### FROM 18 TO 20.

A Novel by an Unknown Author, which will be read with considerable curiosity and interest. 12mo. Attractive cloth binding. \$1.00.

### THE ANIMAL LIFE OF OUR SEASHORE.

With illustrations. Special reference to the New Jersey Coast and the Southern Shore of Long Island. By ANGELO HELPRIN, Professor of Invertebrate Paleontology at the Academy of Natural Sciences of Philadelphia; author of "Town Geology," "Lesson of the Philadelphia Rocks," etc. 12mo. Cloth. \$1.25. Paper. 50 cents.

### LACONISMS.

The wisdom of many in the words of one. By J. M. P. OTTS, D.D. Small 12mo. Extra cloth. 75 cents.

### THE CHEMICAL ANALYSIS OF IRON.

A Complete Account of All the Best-known Methods for the Analysis of Iron, Steel, Pig-Iron, Iron Ore, Limestone, Slag, Clay, Sand, Coal, Coke, Furnace and Producer Gases. By ANDREW ALEXANDER BLAIR, Chief Chemist United States Board, Appointed to Test Iron, Steel, and Other Metals, 1875; Chief Chemist United States Geological Survey and Tenth Census, 1880. 100 illustrations. Octavo. Extra cloth. \$4.00.

If not obtainable at your Booksellers', send direct to the Publishers, who will forward the books, postpaid, on receipt of the price.

**J. B. LIPPINCOTT COMPANY,**  
PUBLISHERS,  
715 & 717 Market Street, Philadelphia.

## AMERICAN GUIDE-BOOKS.

All Newly Revised in 1888. \$1.50 Each.

**The White Mountains.**—Eighth Edition. 12 Maps. North Conway, Fryeburg, Jackson, Mount Washington, Bethlehem, Jefferson, Lancaster, Littleton, Franconia, Pemigewasset Valley, etc. Contains the New Map, the result of the labors of the Appalachian Mountain Club.

"The best book ever made for a similar purpose. As a matter of economy, no visitor to the White Mountains should be without it."—*Magazine of American History.*

"These exquisitely rich and fine volumes serve also as pleasant reminders of days spent in rational enjoyment. To travel with one of these guide-books is a liberal education."—*Beacon.*

**New England.**—Eleventh Edition. 500 pages. 17 Maps. Berkshire, Stockbridge, Lenox, Green Mountains, Lake Champlain, Moosehead Lake, Mount Desert, Nantucket, Cape Cod, etc.

"Complete, exhaustive, and exact. It is not only a good thing for a traveling-satchel, but deserves a place in the library."—*Outing.*

**The Maritime Provinces.**—Seventh Edition. 8 Maps. Nova Scotia, Labrador, Cape Breton, Newfoundland, Halifax, St. John, Quebec, etc.

"Whoever visits the famous Bras d'Or, or the Land of Evangeline, or Grand Manan, or other resorts of this picturesque and historic region—the land of perpetual coolness and quaintness—will find this book invaluable."—*Graphic.*

"Its fund of instruction to tourists is really immense."—*Literary World.*

"A rich treasury of everything the tourist wants to know about those delightful countries."—*Boston Gazette.*

### TICKNOR'S PAPER SERIES.

"Charming books for a corner, for the hammock, or the woodland copse."—*White Mountain Echo.*

**HOWELL'S The Minister's Charge.**

**Sons and Daughters.**

**BYNNER'S Agnes Surriage.**

**BELLAMY'S Looking Backward.**

**HELEN D. BROWN'S Two College Girls.**

**HOWELL'S The Rise of Silas Lapham.**

Forty volumes now ready. 50 cents each. Illustrated catalogue of all sent free.

### NEW NOVELS, ETC.

**Agatha Page.**—By ISAAC HENDERSON. \$1.50.

**The World's Verdict.**—By M. HOPKINS, JR. \$1.50.

**Queen Money.**—By the author of "Margaret Kent." \$1.50.

**Olivia Delaplaine.**—By E. FAWCETT. \$1.50.

**Isidra.**—By WILLIS STEELL. \$1.25.

**The Pilgrim Republic (Plymouth).**—By Hon. JOHN A. GOODWIN. 8vo. With maps, etc. \$4.00.

**Harvard Reminiscences.**—By DR. ANDREW P. PEABODY. \$1.25.

**Homestead Highways.**—By H. M. SYLVESTER.

**The Ethics of Boxing and Manly Sport.**—By JOHN BOYLE O'REILLY. \$1.50.

Sold everywhere. Sent post-paid on receipt of price by

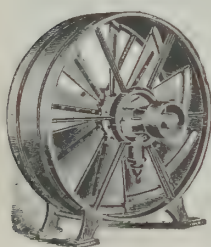
**TICKNOR & CO., BOSTON.**

## SEBASTIAN, MAY & CO.,

Manufacturers of and Dealers in

## Hand and Foot Power Machinery

For CARPENTERS, BUILDERS, MACHINISTS, etc.  
183 W. Second St., Cincinnati, O.



## Clark's New Drying Exhaust and Ventilating Fans.

PATENT ADJUSTABLE WINGS.

Capacity Quickly Increased or Diminished.

Self-Oiling Bearings. Light Running.  
Durable.

PRICE LIST FREE.

GEO. P. CLARK, (Box A), Windsor Locks, Ct.

JAMES GOLDSMITH, New York Agent, 744 BROADWAY.

## E. J. JOHNSON, SLATE BLACKBOARDS, ROOFING SLATE.

SLATE ROOFERS' SUPPLIES.

HEARTHES, SILLS, LINTELS, STEPS, MANTELS.

Special orders will receive prompt attention. Send for estimates.

Quarry: Bangor, Pa. Office: 18 Burling Slip, New York.

Send for descriptive circular of Indestructible Slate Roof for Flat Roofs only.



## The Old Bangor Slate Company

F. C. YARNALL, President,  
PHILADELPHIA.

J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawed Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.



GATES IMPROVED HOT WATER HEATER.

This is the only system of heating which, with cold weather and warm rooms, has smoke pipe only warm. I have never seen steam heater, furnace, or other hot water heater that would do this. Hence, greater economy of fuel over all others; and while this possesses every advantage that others have, this also has the positive circulation to each room due to the independent boiler system. Notice, this is the only system having tank for water supply in cellar, and will, for a month at a time, supply water automatically to each radiator. This works by air pressure. Improved noiseless circulation. Stops the overflow which is liable to occur with open tanks in upper rooms. No overflow to wet ceilings and ruin house. Perfect combustion of fuel, because no water comes around the fire, and more boiler surface exposed to fire than usual to do same work. Boilers for house heating each 3 1/2 in. in diameter, 8 ft. 6 in. long.



Scale 1/4 in. to Foot.

SOME OF PARTIES USING THIS SYSTEM.

Senator Hartwell, Geo. F. Simonds, C. H. Whittemore, A. W. Baker, H. F. Coggeshall, E. A. Goodrich, Alonzo P. Goodrich, John M. Carpenter, David E. Rand, Fitchburg, Mass.; Dr. Hartwell, Ayer, Mass.; D. G. Hitchcock, Warren, Mass.; O. L. Cowles, J. U. Johnson, Springfield, Mass.; E. L. Lyman, J. G. Bishop, Holyoke, Mass.; S. P. Gardner, Haverhill, Mass.; Dr. E. E. Denniston, S. D. Drury, Geo. F. Drury, O. C. Bridgman, R. S. Bartlett, Northampton, Mass.; S. F. Snow, J. S. Wilcox, Deep River, Conn.; J. W. Rigdon, Topeka, Kansas; A. N. Stanton, Bridgeport, Conn.; Heslop & Curtis, A. C. Van Gilder, Point Pleasant, W. Va.; Mrs. A. E. Leonard, Westfield, Mass.; C. A. Gridley, So. Hadley, Mass.

For full particulars and price, address

E. N. GATES, Box 1504, Fitchburg, Mass.



Warren's Natural Asphalt Roofing.

Superior to all others for Flat Roofing.

Over 20,000,000 square feet used within 10 years.

This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.

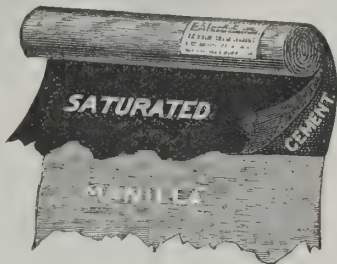
"COMPOSITE" FELT.

For Roof Foundations.

A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is absolutely impervious to moisture; for use under slate, shingles, etc., it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete water-proof covering.

Send for samples and Circular No. 2.

WARREN CHEMICAL & MFG. CO., No. 114 John Street, New York.



THE PRENTICE METALLIC HIP SHINGLE

Patented Sept. 21, 1886.

Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow-tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application. Price \$3.00 per hundred. Small lots sent by express C. O. D. When ordering give pitch of roof. Liberal discounts to dealers and agents. Send for circulars. Address

Metallic Hip Shingle Co., Toledo, O.  
Sole Manufacturers. Lock Box 184.  
Orders promptly filled.

Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.

J. DUNFEE & CO.,  
Wood Carpet and Weather Strips  
OF ALL KINDS,

102 Washington Street, - - CHICAGO.

SEND FOR CATALOGUE.

Factory, 204 to 212 South Clinton Street.

EDWARD FORD, PREST.  
A. PITCAIRN, VICE-PREST.

E. L. FORD, SECY.  
JOHN F. SCOTT, TREAS.

PITTSBURGH PLATE GLASS CO.,

CREIGHTON, PA.,

MANUFACTURERS

POLISHED PLATE GLASS.

Ground and Rough Plate Glass for Floors and Skylights.

Three-sixteenths thickness, made expressly for fine residences.

LARGE AND WIDE GLASS A SPECIALTY.

The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.

IMMENSE PRODUCTION.

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.

The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.

CORRESPONDENCE SOLICITED.

Works No. 1,

CREIGHTON, PA.

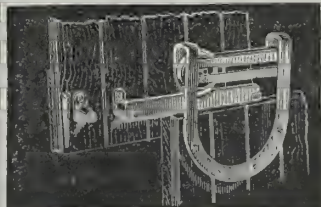
Works No. 2,

TARENTUM, PA.

WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL OFFICE, CREIGHTON, PA.

LANE'S PATENT STEEL DOOR HANGER

The most perfect Anti-Friction Hanger in the Market.



BECAUSE

It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

LANE'S PATENT TRACK  
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

Manufactured by LANE BROS., Poughkeepsie, N. Y.

JOHN H. GRAHAM & CO., General Agents, 113 Chambers St., N. Y.

SOLD BY HARDWARE DEALERS GENERALLY.

ADAMANT

WALL PLASTER.

MANUFACTURED BY

Adamant  
Manufacturing  
Company.

OFFICE

63 EAST GENESEE STREET,  
SYRACUSE, N. Y.

The New, Cheap, and Only Superior  
Substitute for Common Plaster.

It is hard as marble, and will last as long as the building.

It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.

It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.

It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.

It does not crack or fall off, even in case of leakages.

It is applied easily by any good mason.

It is the only material with which repairing can be done neatly and "to stay."

For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,

For Pennsylvania, KEYSTONE PLASTER CO., 233 No. 23d St., Philadelphia,

or, " " " " Williamsport, Pa.

For Massachusetts and Rhode Island, BAY STATE ADAMANT CO., 164 Devonshire St., Boston, Mass.

For Connecticut, CONNECTICUT ADAMANT CO., 480 Grand Avenue, New Haven, Conn.

For New Jersey, NEW JERSEY ADAMANT CO., 61 Passaic Avenue, Harrison, N. J.



**PANCOAST & ROGERS,**

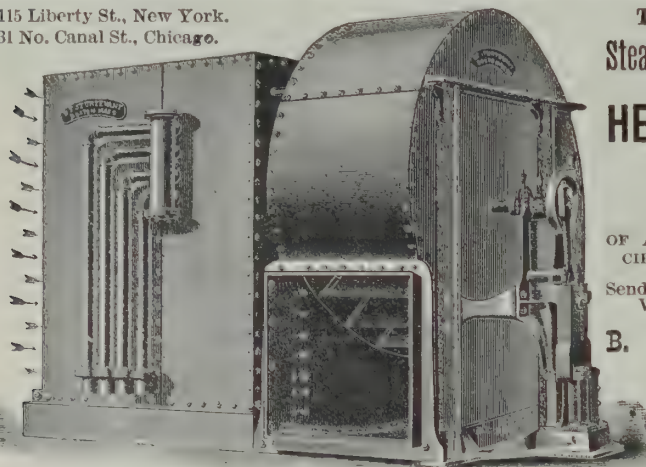
GENERAL AGENTS FOR

**READING IRON WORKS,** Wrought Iron Pipe, Boiler Tubes, Artesian and Oil Well Tubing, Casing, Line Pipe, etc. Special work of every kind in Wrought Iron**CHAPMAN VALVE MFG. CO.** Valves and Gates for Gas, Steam, Water, Oil, etc.,  $\frac{1}{2}$ " to 48" diam. Fire-Hydrants.**THE WATERBURY MALLEABLE IRON CO.** Malleable and Gray Iron Fittings for Gas, Steam, and Water.

MANUFACTURERS' AGENTS FOR

**CAST IRON WATER & GAS PIPES, SPECIAL CASTINGS,**  
And Dealers in Supplies of Every Description.

Office &amp; Warehouse, 28 Platt &amp; 15 Gold Sts., New York.

115 Liberty St., New York.  
31 No. Canal St., Chicago.**THE STURTEVANT**  
Steam Hot Blast Apparatus  
FOR**HEATING and**  
**VENTILATING**  
**BUILDINGS**OF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.Send for Illustrated Treatise on  
Ventilation and Heating.**B. F. STURTEVANT,**  
**BOSTON, MASS.**

BRANCHES:

New York. Chicago.

**"PERFECT"**

TRADE MARK

**Hot Water**  
**Heater.****Hot Water**, as a medium for heating **Private and Public Buildings**, is largely engrossing the attention of the **public**, as being more satisfactory and certain in its operation, and more easily managed than **Steam**. Having constructed a **Hot-Water Heater** that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

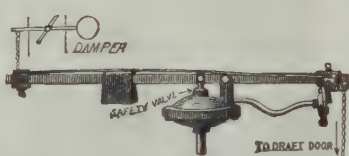
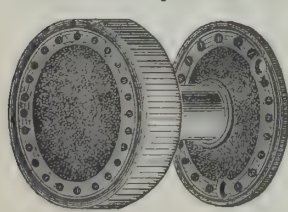
**Richardson & Boynton Co., Mrs.,**  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.**The Globe Steam Heater**

Has been thoroughly tried in many private and public buildings and always found to be the best. Very economical, and easily managed.

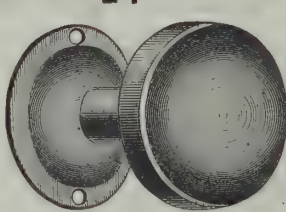
Large surface exposed directly to the fire. Ask for all particulars before you place your order for any other.

**THE GLOBE SAFETY DAMPER REGULATOR SHOULD BE USED ON EVERY STEAM HEATER IN USE.**

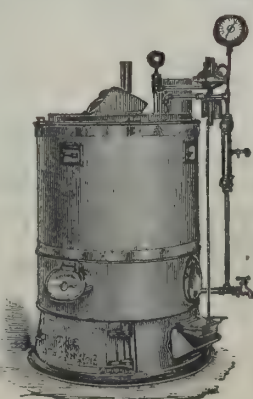
For new Illustrated Price List of Globe Steam Heating Appliances, address

**Globe Steam Heater Co., North Wales, Pa.****HEMACITE.**Easily the Best and  
Handsomest  
Interior Door-Handle

Address

**DIBBLE MFG. CO.,**  
Trenton, N. J.**THE IMPROVED**  
**Auburn Boiler**  
—FOR—  
**Steam or Hot Water.**  
**AUTOMATIC, SELF-FEEDING, PORTABLE.**

Requires attention but once in from twelve to twenty-four hours. Fuel magazine surrounded by water. Self-locking shaking grate. Waste of coal impossible. No dust. No gas.

**Woodcock & Co., Auburn, N. Y.****THE**  
**Woodcock Patent Shaking Grate,**  
FOR  
**BOILER FURNACES**  
OF ALL DESCRIPTIONS.

Saves its cost in a year, supplanting all other shaking grates. No waste of coal. No burnt or broken grates. Self-locking, and as nearly automatic as a grate can be made.

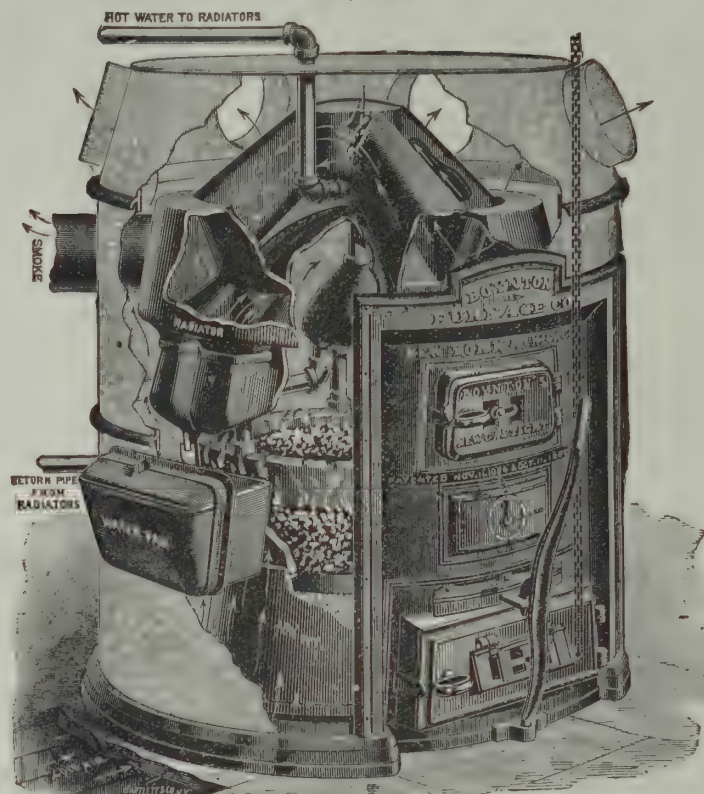
Send for Illustrated Catalogue.

**Woodcock & Co., Auburn, N. Y.****THE BOYNTON FURNACE CO.****207 & 209 WATER STREET, NEW YORK;**  
**47 & 49 DEARBORN STREET, CHICAGO, ILL.,**

—SOLE MANUFACTURERS OF—

**Boynton's "New Gas Tight" Self-Clearing Hot Air**  
**Furnace with Hot Water Combination.**

Patented October 11th, 1887.

**THOROUGHLY TESTED, AND NO EXPERIMENT!**

Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

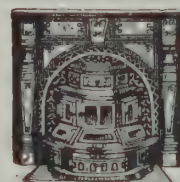
The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The **HOT WATER HEATER** is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or all Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.

**BIBB'S** Celebrated Original  
**BALTIMORE**  
**FIRE-PLACE**  
**HEATERS**To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world. **THE B. C. BIBB STOVE CO.** Store Founders, Baltimore, Md. **HARLEIGH SLATE MANTELS** Send for Circulars and prices.**PATENTS.****MESSRS. MUNN & CO.**, in connection with the publication of the **SCIENTIFIC AMERICAN**, continue to examine improvements, and to act as Solicitors of Patents for Inventors.In this line of business they have had *forty-one years* experience, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.**MUNN & CO., Solicitors of Patents,**  
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

**STEAM HEATERS.**The most Reliable,  
Durable, and Economical in the market.**Simple,**  
**Cheap,**  
**Safe.**

Require no brick work.

Are absolutely automatic.

A servant or child can manage them.

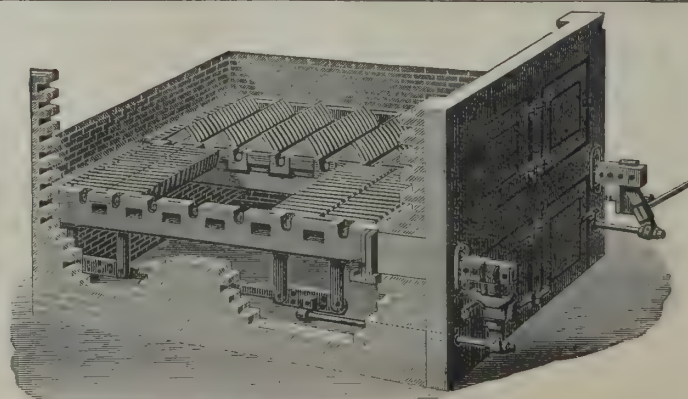
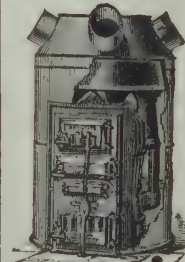
Send for Illustrated Catalogue.

**The Silsby Manuf'g Co.,****221 FALL STREET,****SENECA FALLS, N. Y.****BARSTOW STOVE COMPANY,**

—MANUFACTURERS OF—

**Cast Iron and Steel Plate Furnaces,**  
**Portable and Brick Set Ranges, Parlor**  
**Stoves, and Baltimore Heaters.**

SEND FOR ILLUSTRATED CATALOGUE.

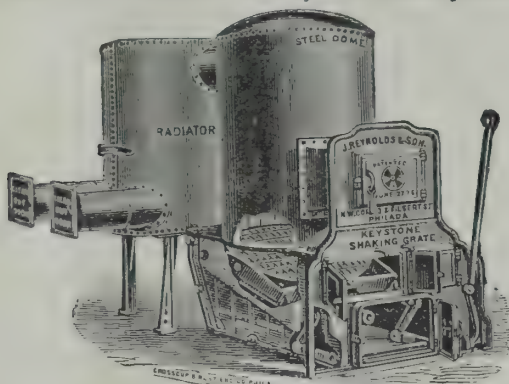
**BARSTOW STOVE CO.,****230 Water Street, NEW YORK; 56 Union Street, BOSTON;**  
**PROVIDENCE, R. I.**



"The Best is the Cheapest."

"A Perfect Furnace at Last."

# Keystone Steel Furnaces, Air Tight Steel Furnaces, Manufactured by J. REYNOLDS & SON, 13th and Filbert Sts., Philadelphia.



These Furnaces are supplied with **THE "REYNOLDS CLINKER CUTTING GRATE"** with Patent Dumping Attachment, the best **LABOR** and **FUEL SAVING** invention ever applied to **HEATING APPARATUS**. It is perfection. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly **GAS, SMOKE** and **DUST TIGHT**.  
**SEND FOR CIRCULAR.**

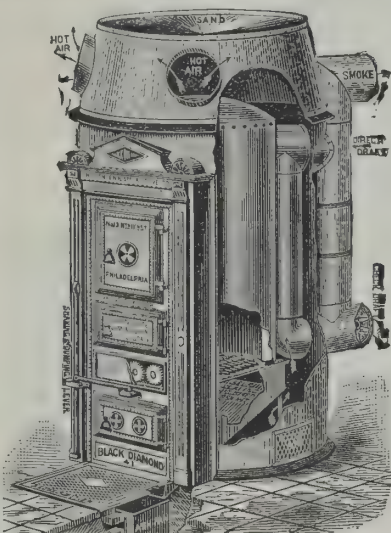
## Black Diamond Steel Dome Furnaces.

ALL SIZES.

Patent Self-Cleaning Ash Pit  
Obviates labor, dirt, and annoyance. Sure preventive from fire caused by hot ashes.

Patented and Manufactured by

**The Schoen Heater  
and Stove Co.**



**PORTABLE and  
BRICK SET.**

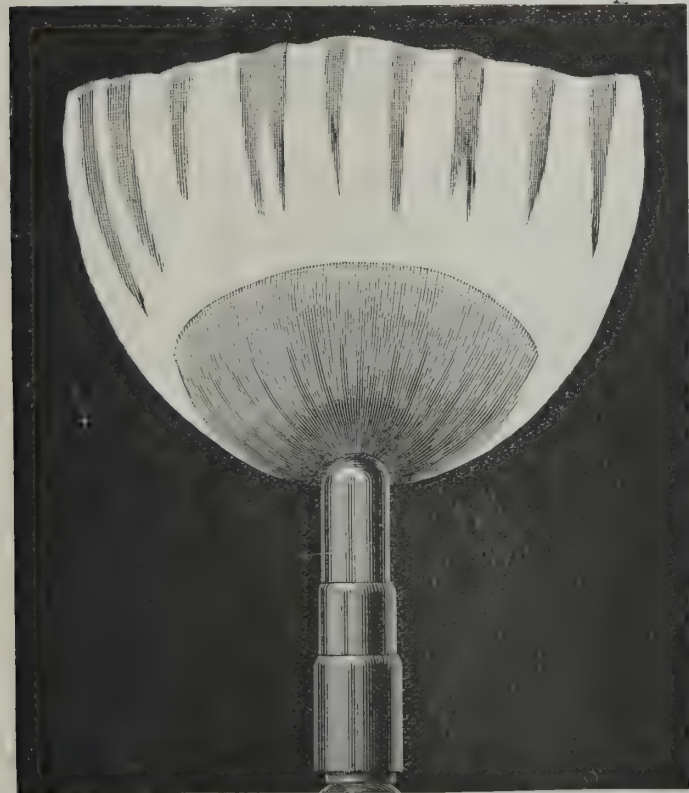
Common Sense Clinker-Crushing Grate. Great saving of labor and fuel.  
Perfect Dump

Office and Salesroom

**13 North Eleventh St.  
Philadelphia.**

**SEND FOR ILLUSTRATED CATALOGUE.  
AGENTS WANTED IN EVERY TOWN.**

## Tirrill's Equalizing Gas Machines.



The only machine in the world that can make this white, smokeless flame with an ordinary Gas Burner.  
**SEND FOR CIRCULARS.**

**TIRRILL GAS MACHINE CO., 39 Day Street, New York.**

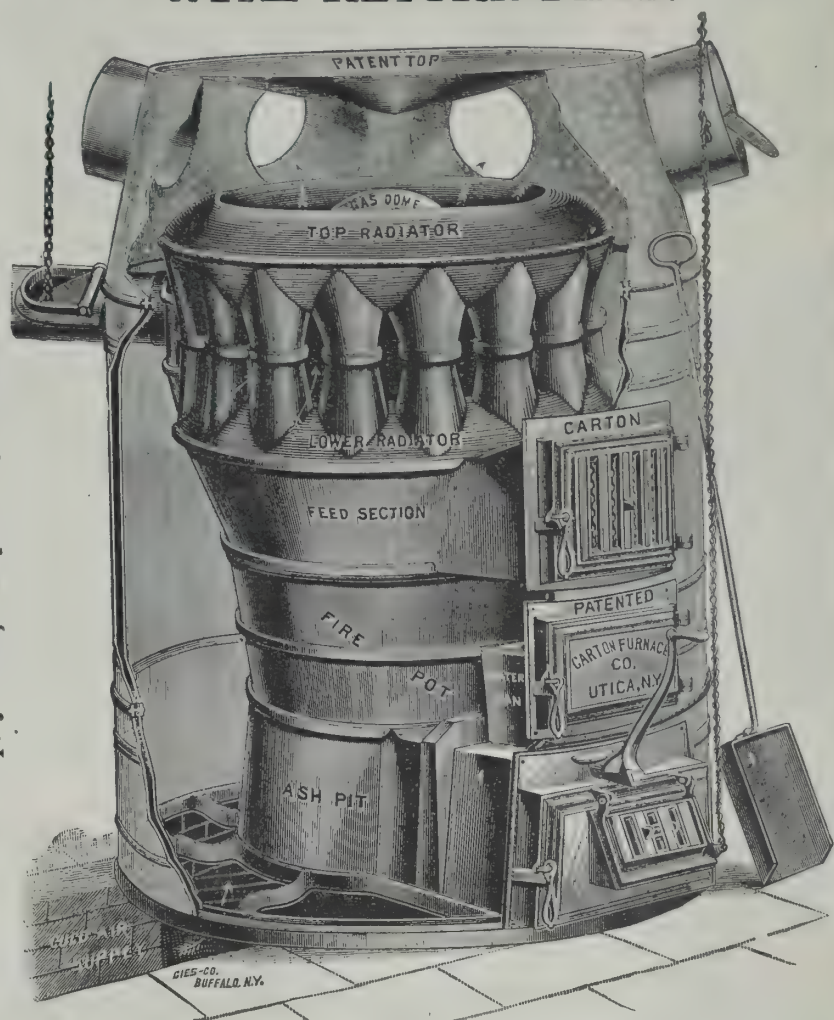
For circulars and information address

Makes Standard, Uniform, White, and Absolutely Smokeless Gas.

Produces this exact flame with any open burner of suitable size. The only machine in the world that can do it. No Argands or adjustables required.

**TIRRILL'S EQUALIZING GAS MACHINE**

## NEW "CARTON" WITH RETURN-FLUE.



Return-Flue constructed without bolts, without dampers, and positively self-cleaning.

All Cast Iron. Self-cleaning. Two Radiators and No Bolts used. Immense Radiating Surface. "Happy Thought" Revolving "Duplex Grate." NO CLINKERS.

New Catalogue for 1888 now ready. Send for one.  
Sole Owners and Manufacturers,  
**CARTON FURNACE CO.**  
**UTICA, N. Y.**  
Established 1847. Incorporated 1883.

**THE PHONOGRAPH.—A DETAILED** description of the new and improved form of the phonograph just brought out by Edison. With 8 engravings. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT, No. 632**. Price 10 cents. To be had at this office and from all newsdealers.

**ICEHOUSE AND COLD ROOM.—BY R. G. Hatfield.** With directions for construction. Four engravings. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT, No. 632**. Price 10 cents. To be had at this office and from all newsdealers.

## The Illustration Represents

A page from our catalogue reduced to one-quarter of the original size.

So much of a reduction necessarily affects the appearance, but we will send a full sized copy of our catalogue No. 12 on receipt of 8 cents postage.

**TOOLS FOR  
CARPENTERS,  
PATTERN-MAKERS,  
CARVERS,  
MILLWRIGHTS,  
AND ALL  
WOOD-WORKERS.**

This Catalogue we have just received from the printers, and it is the most complete one we have yet issued. 192 pages, 700 illustrations. **ASK FOR CATALOGUE No. 12.**

**CHAS. A. STRELINGER & CO., DETROIT, MICH.**

66 WOODWARD AVENUE, DETROIT, MICH.

### SPIRAL SCREW DRIVERS.

These drivers class among the most wonderful labor-saving tools ever invented. This method of driving small and medium sized screws is an entire revolution. It saves fully two-thirds of the time as it will drive screws in either soft or hard wood in one-third of the time as compared with an ordinary screw driver. It is operated by simply pushing on the end of handle. The "Razor's Edge" Blade" shown in another part of catalogue is also excellently well adapted to this purpose.

CAUTION—Be sure and oil often; there is great friction, and they will last twice as long if kept properly oiled.

#### ALLARD'S SPIRAL SCREW DRIVER.

Price, each, (Postage, 15 cts.), \$2.00

#### DECATUR (or Olsen's) SPIRAL SCREW DRIVER.

Regular size, price each, \$1.40 | Small size, price each, \$1.25  
Postage, on large size, 15 cts.; on small size, 10 cts.

#### ELLRICH SPIRAL SCREW DRIVER.

Regular size, price each, \$1.40 | Small size, price each, \$1.25  
Postage, on large size, 15 cts.; on small size, 10 cts.

#### SHAWER SPIRAL SCREW DRIVER.

Regular size, price each, \$1.40 | Small size, price each, \$1.25  
Postage, on large size, 15 cts.; on small size, 10 cts.

This is the cheapest device of this kind on the market. One also, (Postage, 10 cts.), price each, \$0.75

#### CHAMPION SCREW DRIVER.

This is an extra quality, heavy, strong, plain Screw Driver, intended for Mechanic's and Millwright's use. The sizes above 12 inch have a double handle so that extra power may be used on heavy work. The handle cannot come off and they are the best driver made for heavy work.

Length of Blade, inches. Price, each.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

PRICE.

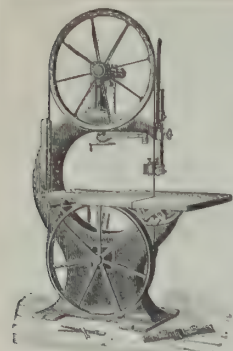
2 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000



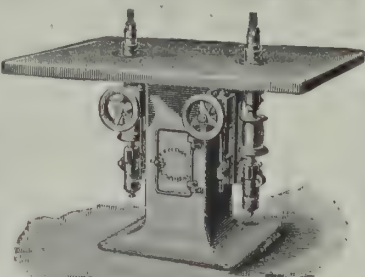
Eight Foot Eave Trough and Gutters.  
**HATTEN, GALPIN & CO., BINGHAMTON, N. Y.**

**HATTEN, GALPIN & CO.**





**CARPENTERS' AND BUILDERS' WOODWORKING MACHINES.**  
Planers, Saws,  
Lathes, Shapers  
Combination  
Machines,  
Shafting, Pulleys, etc.  
**ENTIRE OUTFITS.**  
**F. H. CLEMENT,**  
119 MILL ST.,  
**ROCHESTER, N. Y.**



**WILLER'S PATENT INSIDE SLIDING BLINDS**  
ARE ACKNOWLEDGED THE  
**STANDARD SLIDING BLINDS**  
OF THE COUNTRY.  
They are used in preference to any other  
by the  
**LEADING ARCHITECTS.**

THEY ARE THE ONLY SLIDING BLINDS GIVING  
**Universal Satisfaction.**  
For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**  
Sole Manufacturer,  
Fourth and Cedar Streets, Milwaukee, Wis.  
**AGENTS WANTED EVERYWHERE.**  
State your business when writing for catalogue or agency.

## ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

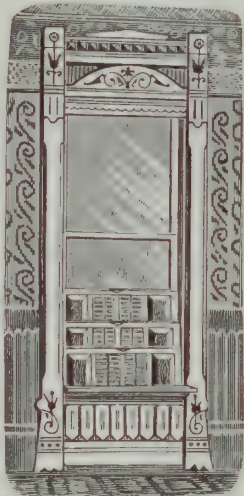
To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

**MUNN & CO., Publishers,**  
361 Broadway, New York.

## HARTMAN'S PATENT INSIDE SLIDING WINDOW BLIND.



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

Agents wanted everywhere. Send for illustrated Catalogue and prices to

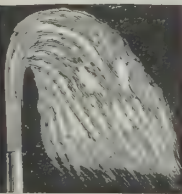
**Hartman & Durstine,**  
**WOOSTER,**  
Ohio,  
Mfrs for U. S. A.  
**Withrow & Hillock,**  
**TORONTO, Can.,**  
Mfrs. for the Dominion of Canada.



## THE CHAMPION SAFETY SASH LOCKS.

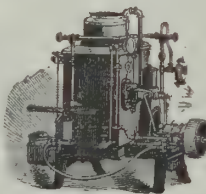
These locks are being received with universal and enthusiastic approval by Architects, Builders, and Hardware Dealers everywhere. All bear testimony to their unequalled merits. Salesmen wanted. — For further information, address the sole manufacturers,

**THE CHAMPION SAFETY LOCK CO.,**  
21 & 23 Champlain St., CLEVELAND, OHIO.



## ARTESIAN

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue.  
**Pierce Well Excavator Co.**  
New York.



## OIL ENGINES.

For Printers, Steam Yachts, pumping water, sawing wood, making ice-cream, Carpenters, Mechanics. 1 to 5 H. P. Fuel, Kerosene. No dust. Automatic in fuel and water supply. Illustrated Catalogue free. Mention SCIENTIFIC AMERICAN.

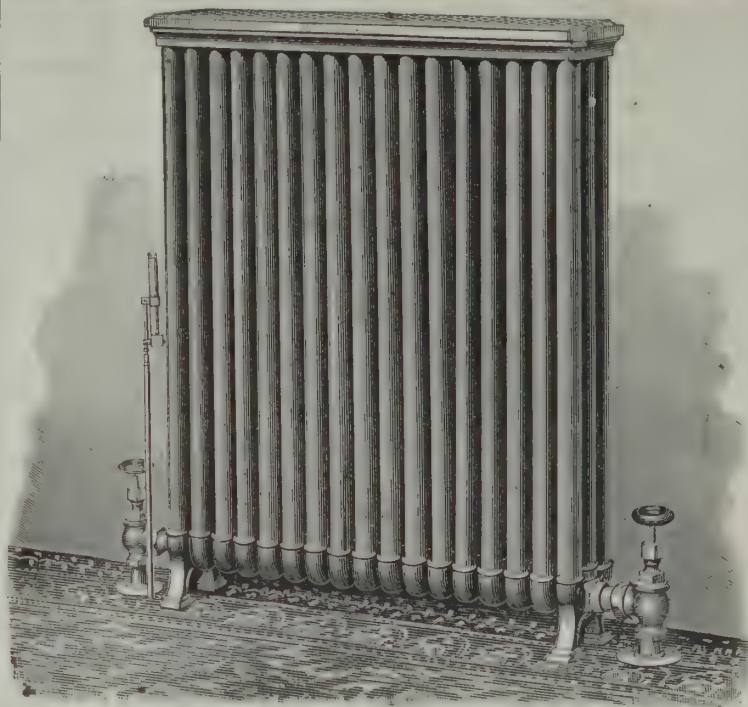
**SHIPMAN ENGINE CO.**  
92 Pearl St., Boston, Mass.

## ARCHITECTURAL PERSPECTIVES.

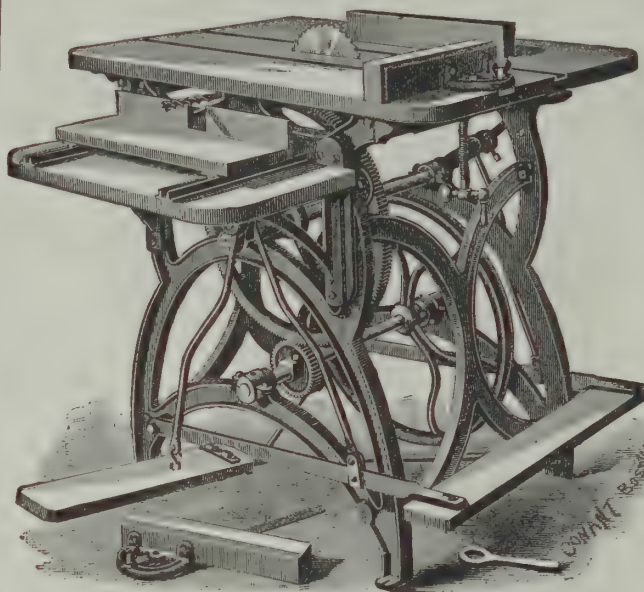
Architects and Builders who have plans which they desire to have put into perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

**MUNN & CO., Scientific American Office, 361 Broadway, New York.**

**THE BRIDGEPORT WOOD FINISHING CO**  
G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN.  
NEW YORK BUSINESS OFFICE, 96-98 MAIDEN LANE. MANUFACTURERS OF  
**WHEELER'S PATENT WOOD FILLER.**  
**BREINIG'S LITHOGEN SILICATE PAINT.**  
**LITHOGEN PRIMER, WOOD STAINS**  
**SILEX FLINT AND FELDSPAR.**  
PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.



**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
STEAM HEATING ENGINEERS.  
Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.



## MARSTON'S Hand & Foot Power Circular Saw.

Iron frame 36 inches high. Top 30 x 40 inches, centre part of iron with planed grooves on each side of saw for cutting off gauges to slide in. Ripping gauge slides in iron groove. Steel shafts. Gears are all machine cut from solid iron. Boring table and side treadle. Two 6-inch saws and two cranks with each machine. Weight 350 pounds.

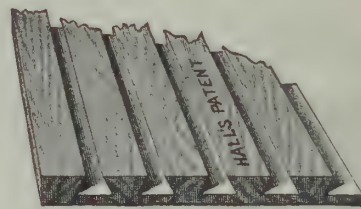
Send for price list.

**J. M. Marston & Co.**  
Cor. Appleton & Tremont Sts.,  
**BOSTON, MASS.**

## HOW TO BUILD A PERFECT HOME WITH VERY LITTLE COST.



USE  
COMBINED  
SHEATHING  
LATH.



Hall's Patent.

It makes a cheaper, warmer and stronger house than brick or stone. It is a dry and therefore a healthy house. The plaster will not crack. Architects and Builders specify it all over the country.

ADDRESS

## The Byrkit-Hall Sheathing Lath Co.,

226-228 LA SALLE STREET, Room 28, CHICAGO, ILL.

For Eastern and New England States, address

**I. G. JENKINS, OSWEGO, N. Y.**



## — THE — Timby Burglar-Proof SASH LOCK AND VENTILATOR.

One Lock only required for a Window. It locks either or both sash securely in any position desired, thereby affording the means of Perfect Ventilation; also absolute security against Burglars and Sneak-Thieves.

Its simplicity, automatic action, strength, ventilating qualities, and adaptability to varying thicknesses of sash or inside stops, render it more desirable than any other Sash Lock now offered in the market.

Manufactured from the Best Malleable Iron, Steel, Brass and Bronze Metal.

**Jenkins & Timby,**  
Manufacturers,  
**OSWEGO, N. Y.**



# THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.

## TILES.

NEW PRINCIPLE. Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

## SHINGLES.

Gothic Pattern. The BEST SHINGLE ever offered to the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

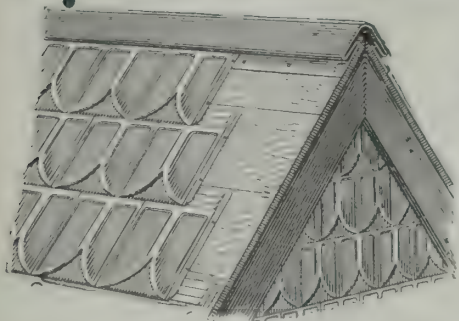
Illustrated Catalogue mailed to any address an application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.



Shield Tiles as laid on roof with Roll Ridge Coping.



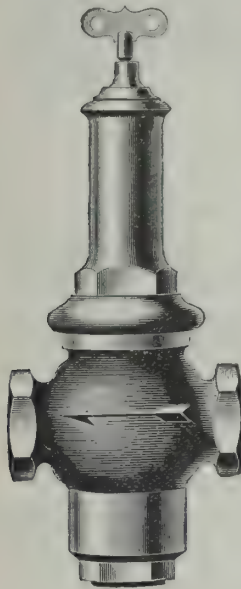
Our Gothic Shingle and Plain Ridge Coping.

## OUR REDUCING VALVE

Is the standard used by the American and Southern Cotton Oil Companies and all the Sugar Refineries.

MASON  
REGULATOR  
CO.,  
BOSTON.

Steam Regulating  
Devices.



# PEERLESS BRICK CO.

PHILADELPHIA, PA.

1003 WALNUT ST.

WORKS—70 Acres—Old York Road and  
Nictown Lane.

PLAIN, PRESSED FRONT,  
ORNAMENTAL & MOLDED

## BRICKS

MADE OF

THOROUGHLY TEMPERED CLAY.

16,000,000 Bricks Annually.

5,000,000 PRESSED FRONT BRICKS,

QUALITY and FINISH  
UNEQUALED.

600 DIFFERENT DESIGNS AND SHAPES.

VARIOUS SIZES, COLORS, AND SHADES.

Red, Buff, Drab, Brown, Gray,  
Black, White and Pompeian.

Orders filled for large quantities of PRESSED FRONT or FACE BRICKS of any one shade.

BRICK FIRE PLACES and MANTELS.

ARCHES of all kinds ground and fitted from drawings  
furnished to us. Full size working plans sent with bricks.

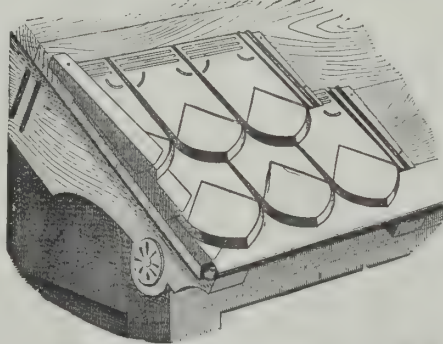
SPECIAL SHAPES made from designs fur-  
nished us by Architects. Bricks shipped in cars at  
our works for all parts of the country. Illustrated  
Catalogue and Price List sent on application.



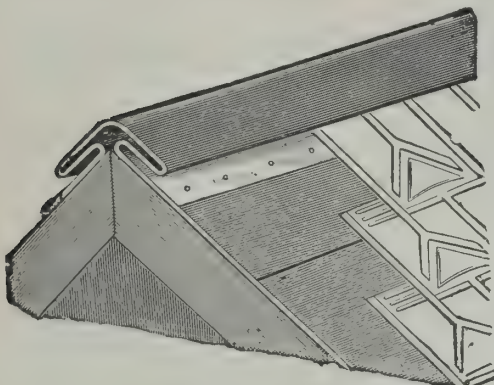
## Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Cooper's Patent Queen Anne Metallic Shingles.



Walter's Patent Standard Metallic Shingles.

### WHOLESALE AGENTS.

W. W. MONTAGUE & Co., San Francisco, Cal., Pacific Coast.  
PHILLIPS & BUTTRESS MFG. CO., Nashville, Tenn.  
MCDONALD, KEMP & Co., Toronto, Sole Agents, Canada.  
KNISELY & MILLER, Chicago, Ill.  
J. J. WALTERS, Denver, Col.  
JEROME TWICHELL & Co., Kansas City, Mo.

THE NATIONAL SHEET METAL ROOFING CO.,

510, 512, 514, 516, 518 & 520 East 20th St., New York.



### SEALED PROPOSALS.

July 11, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 11th day of August, 1888, for the labor and materials required in the completion of the interior finish, including alterations, iron steps, vault doors, etc. for the U. S. Court House, Post Office, etc., building, at Louisville, Ky., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Association, Baltimore, Md., the Builders and Traders' Exchanges at Chicago, Ill., Louisville, Ky., and Kansas, City, Mo., the Builders' Exchanges at Cincinnati, O., Detroit, Mich., and Indianapolis, Ind., and the office of the Superintendent of the old Custom House building at St. Louis, Mo. Each bid must be accompanied by a certified check for \$500. WILL. A. FRERET, Supervising Architect.

July 23, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 11th day of Aug., 1888, for the labor and materials required for the completion of the plumbing, etc., of the Court House, Post Office, etc., at Clarksburg, W. Virginia, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, and at the Builders' Exchanges, Baltimore, Md., and Pittsburgh, Pa. Each bid must be accompanied by a certified check for \$100. WILL. A. FRERET, Supervising Architect.

## RICHMOND WEATHER STRIP CO.

MANUFACTURERS OF

ROWLETT'S INDEPENDENT

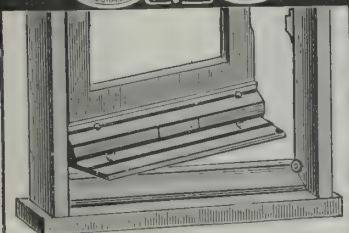
AUTOMATIC COUNTER-BALANCED  
WEATHER STRIP.

AWARDED BRONZE MEDAL AT CINCINNATI INDUSTRIAL  
(EXPOSITION 1884.)

HAS NO SPRINGS, TRIGGERS OR CIRCLE  
IRONS; POSITIVE ACTION; CANNOT GET  
OUT OF ORDER; FITS ANY DOOR.

AGENTS WANTED IN EVERY CITY AND TOWN IN THE U.S.  
SEND FOR CIRCULAR. SAMPLE STRIP, PREPAID TO ANY  
PERSON ON RECEIPT OF \$1.00. ADDRESS

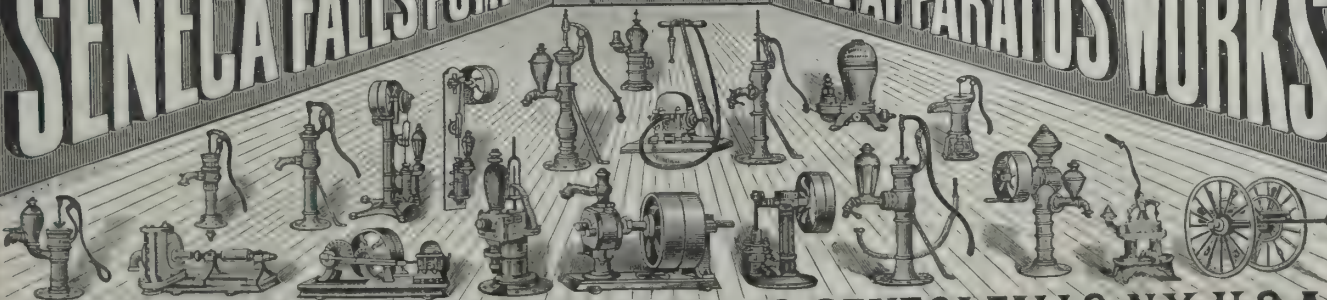
RICHMOND WEATHER STRIP CO. RICHMOND, IND.  
P.O. Box 282. FACTORY 217 N. 6TH STREET.  
MENTION THIS PAPER.



## SENECA FALLS PUMP & FIRE APPARATUS WORKS

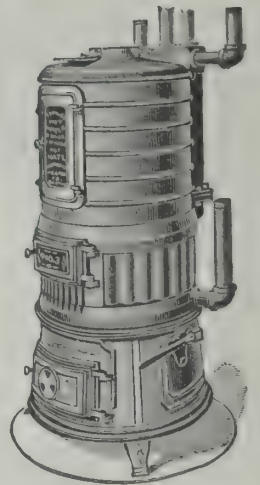
PUMPS  
FOR  
ALL PURPOSES

## SENECA FALLS PUMP & FIRE APPARATUS WORKS

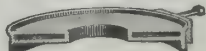
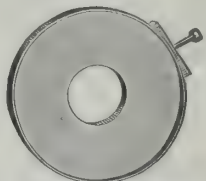


RUMSEY & CO. (LIMITED) PROPRIETORS, SENECA FALLS, N.Y. U.S.A.

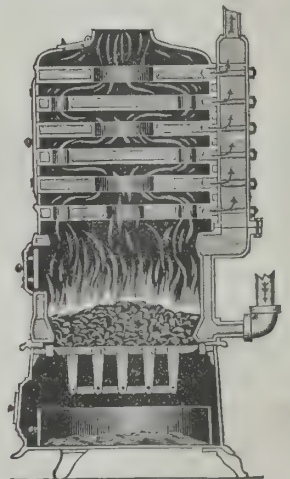
# SPENCE



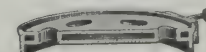
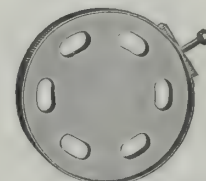
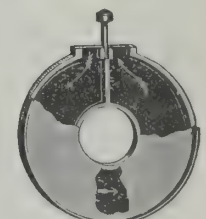
## HOT



## WATER



## HEATER.



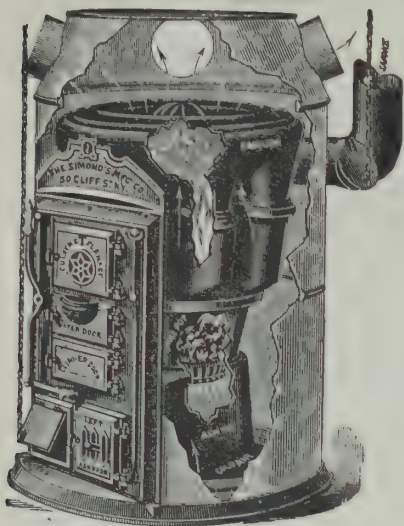
Send for Illustrated Pamphlet to  
National Hot Water Heater Co.  
191 Fort Hill Square, Boston.



Established 1845.

# THE SIMONDS MANUFACTURING CO.

50 Cliff Street, New York.

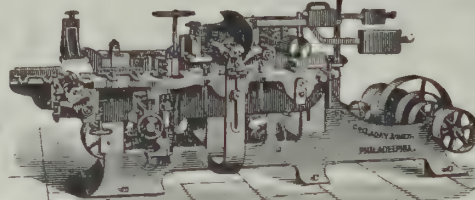
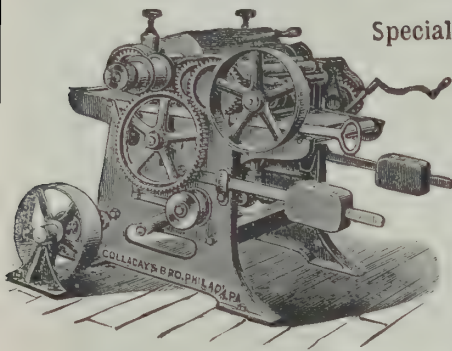


Furnaces,  
AND  
Ranges,  
Registers.

SEND FOR

Catalogues and Price Lists.

## Special Wood Working Machinery



For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc. Manuf'd by Joseph O. Colladay & Bro., Nicholson & Race Street, Philadelphia.

## E. P. WILCE & CO.,

MANUFACTURERS OF

# DOORS, SASH AND BLINDS

FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

Stair Work and Interior Finish, Mantels, Sideboards, Pulpits, Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets,

CHICAGO.

# THE ANDERSON

PRESSED FACE, SHAPE

AND ORNAMENTAL

## BRICK,

In Red, Buff, Brown, Drab, Old Gold, Obsidian, Pink, Black, White, Garnet, Blood Stone, Onyx, Mottled, Drused, Marbled, Roman, Ashlar, etc., are pronounced by Architects, in strength, texture, uniformity of size, color, shades, perfect shape, angles, and lines, the finest in the world, surpassing everything in the art.

### THE ANDERSON COMPANIES

are the largest manufacturers in fine grades of PRESSED BRICK in this country or abroad.

Architects and Builders can obtain illustrated catalogue and any desired information, on application to the nearest Company.

CHICAGO ANDERSON PRESSED BRICK CO., Office, 189-191 La Salle St., Chicago.

NEW YORK ANDERSON PRESSED BRICK CO., Office, 132 Mungin St., New York.

NEW ENGLAND ANDERSON PRESSED BRICK CO., Office, 50 Bromfield St., Boston.

### SEALED PROPOSALS.

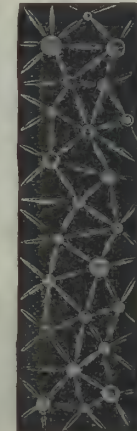
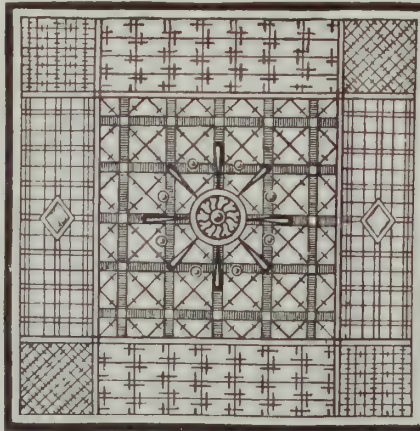
July 21, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 28th day of Aug., 1888, for the labor and materials required for the completion of the Approaches for the U. S. Court House and Post Office building at San Antonio, Texas, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchange at Baltimore, Md., and Charleston, S. C., the Builders' and Traders' Exchanges at Louisville, Ky., and Kansas City, Mo., the office of the Superintendent at Dallas, Texas, and the Mechanics' and Traders' Exchange at New Orleans, La. Each bid must be accompanied by a certified check for \$300. Upon receipt at the office of the Supervising Architect, Treasury Department, of a Post Office money order in amount \$2, payable to the Treasurer of the U. S., parties will be furnished with copies of specification and plans. WILL. A. FRERET, Supervising Architect.

### SEALED PROPOSALS.

July 23, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 11th day of Aug., 1888, for the labor and materials required in the erection and completion of the extension of the U. S. Court House and Post Office building at Jersey City, N. J., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchange, Baltimore, Md., the Builders' Exchange, Newark, N. J., the Mechanics' and Traders' Exchange, New York City, and the Master Builders' Exchange, Philadelphia, Pa. Each bid must be accompanied by a certified check for \$200. Upon receipt at this office of a Post Office money order, in amount \$2, drawn to the order of the Treasurer of the United States, parties will be furnished with copies of the drawings and specifications. WILL. A. FRERET, Supervising Architect.

July 20, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 29th day of Aug., 1888, for the labor and materials required in the erection and completion of the U. S. Post Office, etc., building at Springfield, Mass. (except the heating apparatus), in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Exchange at Albany, N. Y., the Master Builders' Association, Boston, Mass., Builders' Exchanges at Lynn, Mass., and Baltimore, Md., the Mechanics' and Traders' Exchange, New York, the Mechanics' Exchange at Providence, R. I., and Worcester, Mass. Each bid must be accompanied by a certified check for \$500. Upon receipt at the office of the Supervising Architect, Treasury Department, of a Post Office money order, in amount \$5, payable to the Treasurer of the U. S., parties will be furnished with copies of specification and plans. WILL. A. FRERET, Supervising Architect.

Centre Piece of Ceiling Pattern of Japanese Lattice.



# Mankey Decorative Company,

Incorporated Sept. 9, 1885. Williamsport, Pa., CAPITAL \$100,000.

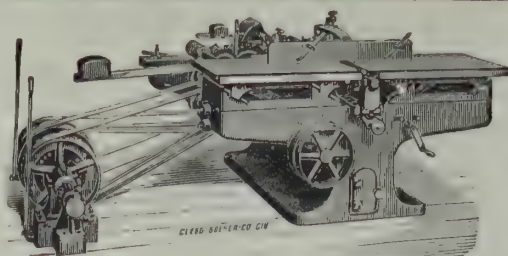
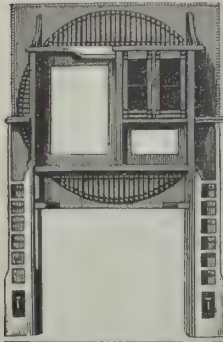
Artistic Wood Decorations for Public and Private Buildings

MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

WOOD MANTELS and DOORS A SPECIALTY.

# ART STAINED GLASS

FOR CHURCHES, DWELLINGS, Etc.  
Keystone Stained Glass Works,  
271 SOUTH 5th ST., PHILADELPHIA.



WOOD WORKER SIDE.

## COMBINED Universal Wood Worker and Molder.

Two machines on one frame, driven by one countershaft, and arranged so that they can be run together or separately.

Address,

The Egan Company  
—BUILDERS OF—

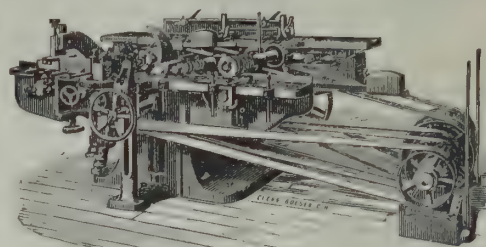
## WOOD WORKING MACHINERY,

209 to 229 W. Front St., Cincinnati, Ohio, U. S. A.

We build the largest and most complete line of improved Wood Working Tools in the U. S. for Carpenters, Builders, Planing Mills, and General Wood Workers.

Complete Outfits Furnished.

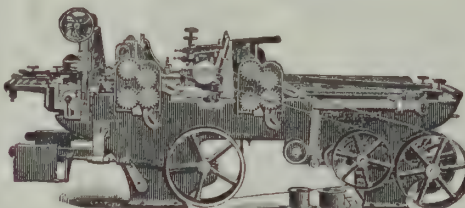
Write for Catalogue and Quotations.



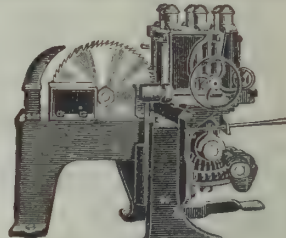
MOLDER SIDE.

(204)

## Woodworking Machinery, Planers and Matchers, Pony Planers, Hand Matchers, Solid Plate and Segment Re-Saws.

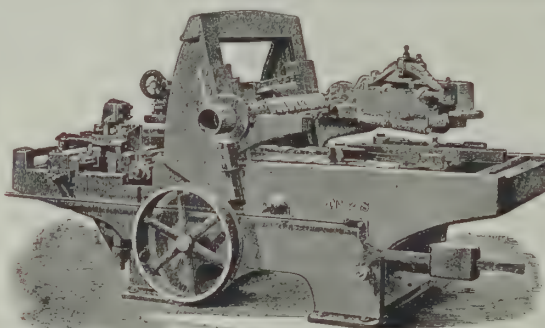


PLANNER AND MATCHER.



SIDING SAW.

## CONNELL & DENCLER, Rochester, New York.



## HOYT & BROTHER CO. AURORA, ILL.

MANUFACTURERS OF

## Machinery for Working Wood.

Planing Mill Machinery  
a Specialty.

Send for Catalogue.

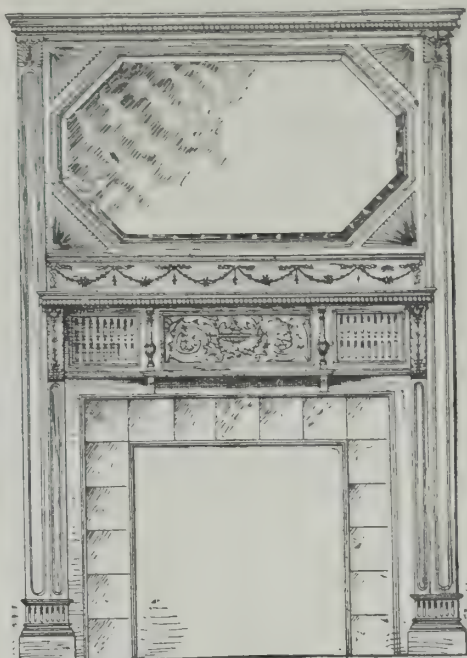


NORTHROP'S PATENT paneled iron ceiling.



E. & C. M.

Far surpassing either plaster or wood ceilings. These ceilings can be laid over old broken plaster as well as on new work. These ceilings are covered by 6 original patents. Send for Illustrated Circulars and Price Lists. A. NORTHROP & CO., Sole Manufacturers, Pittsburgh, Pa.



KEELER & CO.,

WOOD MANTELS

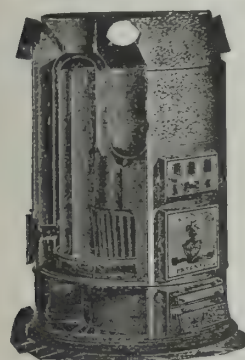
—AND—

FURNITURE,

Made from our own or architect's drawings.

81-91 Washington St.,

Cor. Elm, Boston, Mass.

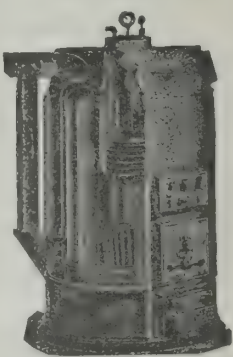


"Alsop" Warm-Air and Combination Warm-Air and Steam Furnace  
THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

IN OFFERING this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a new departure in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation. Manufactured by the ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.



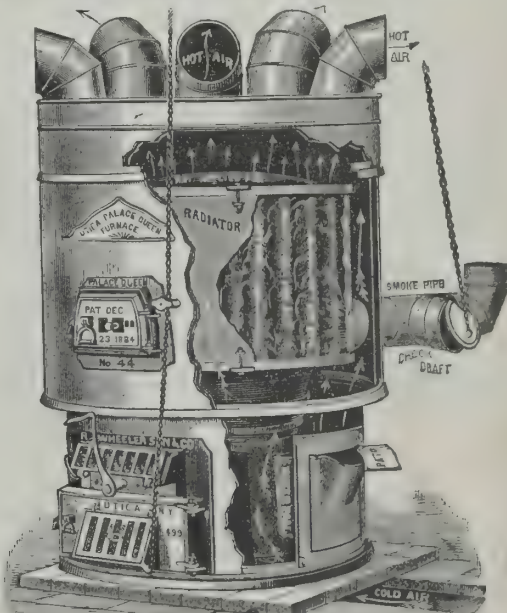
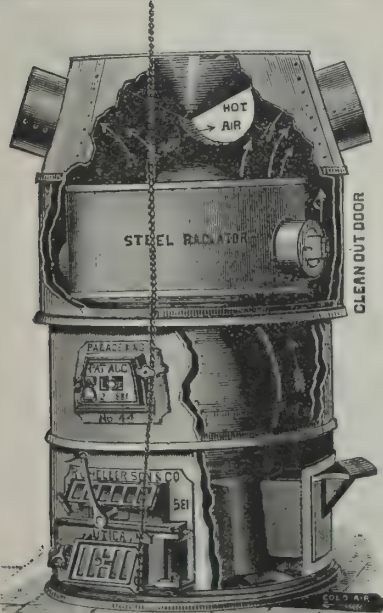
Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

<b>Adjustable Clapboard Marker.</b> Stanley Rule & Level Co. .... cover ii	<b>Bicycles.</b> A. W. Gump & Co. .... cover iii	<b>Clapboard Marker.</b> Stanley Rule & Level Co. .... cover ii	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co. .... i
<b>Adjustable Planes.</b> Stanley Rule & Level Co. .... cover ii	<b>Black Varnish.</b> M. Ehret, Jr., & Co. .... cover iv	<b>Combination Dividers.</b> L. S. Starrett. .... i	<b>Electric Lights.</b> The Thomson-Houston Electric Co. .... cover iii
<b>Advertising Glass Signs.</b> The Western Sand Blast Co. .... iii	<b>Boiler Coverings.</b> M. Ehret, Jr., & Co. .... cover iv Shields & Brown. .... iii H. W. Johns Mfg. Co. .... cover ii	<b>Contractor and Builder.</b> Allen B. Rorke. .... iv	<b>Electrical Supplies.</b> Patrick & Carter. .... cover iv Shaw & Geary. .... cover iv
<b>Annunciators.</b> Patrick & Carter. .... vii	<b>Booksellers and Publishers.</b> Houghton, Mifflin & Co. .... vi J. B. Lippincott & Co. .... vi Ticknor & Co. .... vi John Wiley & Sons. .... vi	<b>Cordage.</b> J. P. Tolman & Co. .... cover ii	<b>Elevators.</b> L. S. Graves & Co. .... v Henry H. Hill. .... ii Howard Iron Works. .... v Morse, Williams & Co. .... ii
<b>Architects' and Surveyors' Supplies.</b> L. Manasse. .... iv	<b>Brass Goods.</b> C. H. Besly & Co. .... ii	<b>Corrugated Iron Lath.</b> The Cincinnati Corrugating Co. .... ii Canton Iron Roofing Co. .... iv N. S. Northrop. .... ii A. Northrop & Co. .... xiii Sykes Iron Roofing Co. .... iv	<b>Engineers' Supplies.</b> L. Manasse. .... iv
<b>Architects.</b> C. Powell Karr, C.E. .... iv Smith, F. L. .... iii	<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.). .... cover iii	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr., & Co. .... cover iv H. W. Johns Mfg. Co. .... cover ii Shields & Brown. .... iii Western Mineral Wool Co. .... v	<b>Feed Water Heaters.</b> Stewart Heater Co. .... cover ii
<b>Architectural Iron Work.</b> Cheney & Hewlett. .... iv Manly & Cooper Mfg. Co. .... iv	<b>Brick.</b> Chicago Anderson Pressed Brick Co. .... xii Peerless Brick Co. .... xi	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot. .... xiv	<b>Fire Apparatus.</b> Rumsey & Co. .... xi
<b>Architectural Wood Turning.</b> Anderson & Dickey. .... iv Standard Wood Turning Co. .... iv	<b>Brick Machinery.</b> Henry Martin. .... v	<b>Cutter Heads.</b> Sam'l J. Shimer. .... iv	<b>Fire Brick.</b> Henry Maurer & Son. .... iii
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.). .... cover iii	<b>Building Paper, Felt, Etc.</b> M. Ehret, Jr., & Co. .... cover iv Warren-Ehret Co. .... cover iii Warren Chemical and Mfg. Co. .... vii H. F. Watson. .... cover iii	<b>Door Knobs.</b> Dibble Mfg. Co. .... viii	<b>Fireproof Building Materials.</b> Henry Maurer & Son. .... iii
<b>Artistic Wood Decorations.</b> Buffalo Novelty Wood Turning Co. .... xii Keeler & Co. .... xiii Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Builders' Scroil Saw.</b> W. F. & J. Barnes Co. .... ii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co. .... xi Canton Iron Roofing Co. .... iv
<b>Artists' Materials.</b> A. H. Abbott & Co. .... cover iii F. W. Devoe & Co. .... i	<b>Cables.</b> Standard Underground Cable Co. .... i	<b>Door Hangers.</b> Lane Bros. .... vii	<b>Fireproofing Material.</b> H. W. Johns Mfg. Co. .... cover ii H. F. Watson. .... cover iii
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr., & Co. .... cover iv Warren Chemical and Mfg. Co. .... vii	<b>Carbolate of Lime.</b> M. Ehret, Jr., & Co. .... cover v	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co. .... ii	<b>Foot and Hand Power Machinery.</b> W. F. & J. Barnes Co. .... ii C. E. Little. .... ii J. M. Marston & Co. .... x Senecan May & Co. .... vi Seneca Falls Mfg. Co. .... ii
<b>Asbestos.</b> H. W. Johns Mfg. Co. .... cover ii H. F. Watson. .... cover iii	<b>Carpenters' Tools.</b> Stanley Rule and Level Co. .... cover ii Strelinger, C. A. & Co. .... ix	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co. .... v M. B. Swezey. .... ii	<b>Furnaces.</b> Abram Cox Stove Co. .... cover iii Barstow Stove Co. .... viii Boynton Furnace Co. .... viii Alsop Furnace and Stove Co. .... xiii Canton Furnace Co. .... ix E. A. Jackson & Bro. .... cover ii Leibrandt & McDowell Stove Co. .... i Omega Grate Co. .... i J. F. Pease Furnace Co. .... i
<b>Auger Bits.</b> Bridgeport Gun Implement Co. .... ii	<b>Carpet Lining.</b> Warren-Ehret Co. .... cover iii H. F. Watson. .... cover iii	<b>Eaves Trough and Gutters.</b> Hatten, Galpin & Co. .... ix	
<b>Automatic Air Valves.</b> Thos. L. McKee. .... ii	<b>Cements.</b> H. W. Johns Mfg. Co. .... cover ii M. Ehret, Jr., & Co. .... cover iv		
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co. .... iv Anderson & Dickey. .... iv	<b>Chandellers.</b> I. P. Frink. .... ii		
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts. .... iii			

PALACE KING  
—AND—  
PALACE QUEEN  
WARM AIR FURNACES.

SEND FOR CATALOGUE.

RUSSEL WHEELER, SON & COMPANY,  
UTICA, N. Y.



CHILTON PAINTS.

The Ohilton Manuf. Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application.

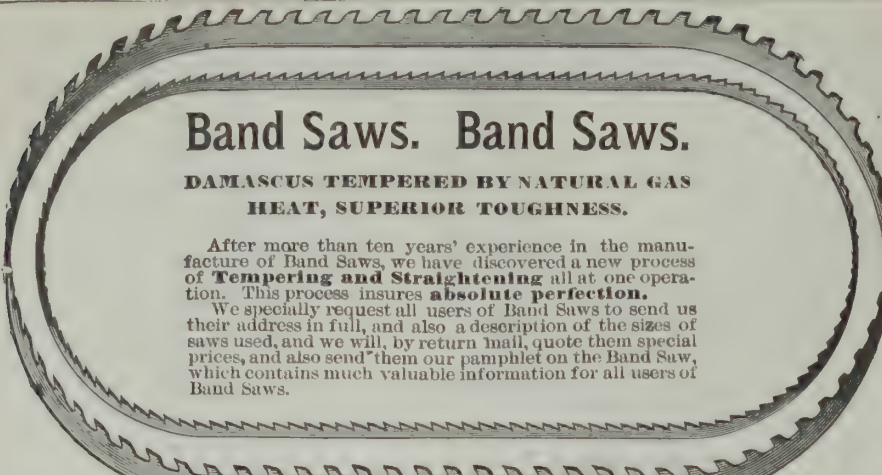
147 Fulton St., New York.  
141 Milk Street, Boston.



### Band Saws. Band Saws.

**DAMASCUS TEMPERED BY NATURAL GAS  
HEAT, SUPERIOR TOUGHNESS.**

After more than ten years' experience in the manufacture of Band Saws, we have discovered a new process of **Tempering and Straightening** all at one operation. This process insures **absolute perfection**. We specially request all users of Band Saws to send us their address in full, and also a description of the sizes of saws used, and we will, by return mail, quote them special prices, and also send them our pamphlet on the Band Saw, which contains much valuable information for all users of Band Saws.



The Superior Quality of our Band Saws, All Tempered, Straightened, and Tried at one operation, which we have patented, makes them so perfect that our **SALES HAVE MORE THAN TREBLED IN THE PAST YEAR.** Our largest and best customers prefer them to the best imported saws.

WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.

**NATURAL GAS**

Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

**OUR CIRCULAR SAW**

Of all sizes from 6 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

**Double Toothed Cross Cuts**

(two saws in one), for all uses **HAVE NO EQUAL.**



Our SAWYER'S HANDBOOK will be sent **FREE** to any part of the world on receipt of full name and address.

Address **EMERSON, SMITH & CO. (LIMITED),**  
**Beaver Falls, Pa.**

CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

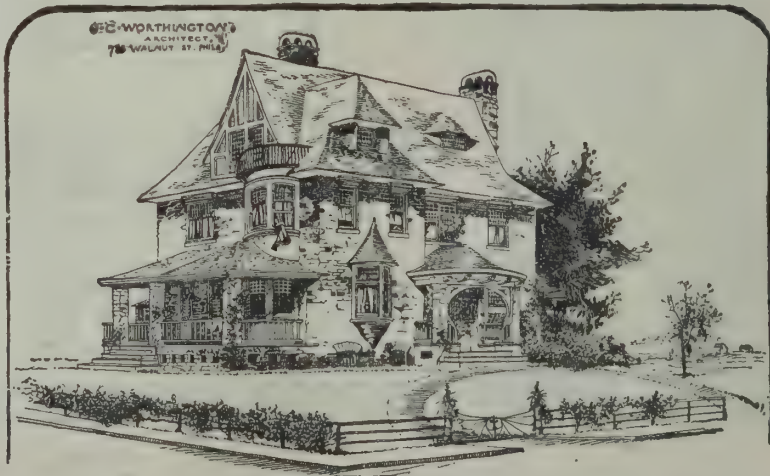
<b>Furnaces.</b> J. Reynolds & Son.....ix Richardson & Boynton Co.....viii Schoen Heater and Stove Co.....ix R. Wheeler, Son & Co.....xiii The Simonds Mfg Co.....xii	<b>Furniture.</b> Keeler & Co.....xiii	<b>Gas and Water Pipes.</b> Gloucester Iron Works.....v Mellert Foundry & Machine Co.....cover iii Pancoast & Rogers.....viii Penna. Pipe Mfg. Co.....cover iv	<b>Gas Engines.</b> Economic Gas Engine Co.....cover ii Williams & Orton Mfg. Co.....ii	<b>Gas Fires.</b> H. P. Dixon & Co.....cover iv	<b>Gas Machines.</b> Tirrill Gas Machine Co.....ix	<b>Glass—Plate.</b> Malaga Glass & Mfg. Co.....cover iv Pittsburg Plate Glass Co.....vii	<b>Glass—Stained and Mosaic.</b> Beacon Stained Glass Works.....cover iii Alfred Godwin.....cover iv Keystone Stained Glass Works.....xii C. H. Postel & Co.....cover iii William Reith.....cover iii F. J. Riester.....cover iii Tiffany Glass Co.....vi	<b>Greenhouse Boilers.</b> Peter Devine.....ii Hitchings & Co.....cover ii New York Central Iron Works.....cover iii	<b>Ground &amp; Rough Glass for Floors, Etc.</b> Pittsburg Plate Glass Co.....vii	<b>Gymnastic Apparatus.</b> Narragansett Machine Co.....xiv	<b>Gypsum Paint.</b> John Maxwell.....iii	<b>Hand Sawing Machines.</b> W. F. & J. Barnes Co.....ii	<b>Heating Apparatus.</b> Abram Cox Stove Co.....cover iii Alsop Furnace and Stove Co.....viii Barstow Stove Co.....viii B. C. Bibb Stove Co.....viii Boynton Furnace Co.....viii Broomell & Sanks.....x Carton Furnace Co.....ix Danforth & Clark.....cover iii Duplex Steam Heater Co.....vi E. N. Gates.....vii Globe Steam Heater Co.....viii Gurney Hot-Water Heater Co.....ii Hitchings & Co.....cover ii E. A. Jackson & Bro.....cover ii Leibbrandt & McDowell Stove Co.....i National Hot Water Heater Co.....i New York Central Iron Works.....cover iii Omega Grate Co.....iv J. P. Pease Furnace Co.....i Pierce, Butler & Pierce.....cover iv J. Reynolds & Son.....ix Richardson & Boynton Co.....viii Schoen Heater and Stove Co.....ix Silsby Mfg. Co.....viii The Simonds Mfg. Co.....xii B. F. Sturtevant.....viii Weston Engine Co.....cover iii R. Wheeler, Son & Co.....xiii Woodcock & Co.....viii	<b>Iron Work for Building Purposes.</b> Cheney & Hewlett.....iv Composite Iron Works.....cover ii Manly & Cooper Mfg. Co.....iv Mellert Foundry & Machine Co.....cover iii	<b>Japanese Fret Work.</b> Buffalo Novelty Wood Turning Co.....xii	<b>Leveling Instruments.</b> John W. Harmon.....ii	<b>Lithographers.</b> Schumacher & Ettlinger.....cover ii	<b>Mail Chutes.</b> The Cutler Mfg. Co.....cover ii	<b>Mantels, Grates, Fire Places, Etc.</b> E. J. Johnson.....vi Chas. B. Kline.....iii	<b>Masons' and Builders' Supplies.</b> S. H. French & Co.....iii Toch Bros.....iii	<b>Mathematical Instruments.</b> F. W. Devoe & Co.....i	<b>Metal Signs.</b> Joseph Neumann Co. (Ltd.).....cover iii	<b>Metallic Roofing Tiles and Shingles.</b> Cortright Metal Roofing Co.....xi Gumme, Sperring & Co.....cover iv Metallic Hip Shingle Co.....vii National Sheet Metal Roofing Co.....xi Thorn Shingle and Ornament Co.....iii	<b>Mineral Wool.</b> U. S. Mineral Wool Co.....v Western Mineral Wool Co.....v	<b>Mortar Colors.</b> S. Bowen's Sons.....v S. H. French & Co.....iii Toch Bros.....iii	<b>Office and Bank Fittings.</b> A. H. Andrews & Co.....iii	<b>Oil Well Supplies.</b> Oil Well Supply Co.....iii	<b>Ornamental Brick.</b> Chicago Anderson Pressed Brick Co.....xii Peerless Brick Co.....xi	<b>Ornamental Glass Work.</b> C. H. Postel & Co.....cover iv The Western Sand Blast Co.....iii	<b>Ornamental Iron Work.</b> Manly & Cooper Mfg. Co.....iv	<b>Ornamental Rustic Work.</b> John Wheeler.....iv	<b>Paints.</b> The Chilton Mfg. Co.....xiii F. W. Devoe & Co.....i S. H. French & Co.....iii H. W. Johns Mfg. Co.....cover ii Prince Mfg. Co.....cover iii The Standard Paint Co.....cover iv	<b>Paneled Sheet Iron Ceiling.</b> H. S. Northrop.....ii	<b>Parquet Floors.</b> J. Dunfee & Co.....vii	<b>Patents.</b> Munn & Co.....xi	<b>Pattern Makers' and Carvers' Tools.</b> C. A. Strelinger & Co.....ix	<b>Pavement Lights.</b> Manly & Cooper Mfg. Co.....iv	<b>Photographic Outfits.</b> E. & H. T. Anthony & Co.....ii	<b>Planing Mill Machinery.</b> Hoyt & Bro. Mfg. Co.....i	<b>Polished Plate Glass.</b> Pittsburg Plate Glass Co.....vii	<b>Porous Terra Cotta.</b> Henry Maurer & Son.....iii	<b>Porous Earthenware.</b> Henry Maurer & Son.....iii	<b>Portland Cement.</b> Howard Fleming.....v Lesley & Trinkle.....cover iv	<b>Poultry Yard Appliances.</b> S. S. Bent & Son.....iv	<b>Prepared Roofing.</b> M. Ehret, Jr., & Co.....cover iv H. F. Watson.....cover iii	<b>Pressed Brick.</b> Chicago Anderson Pressed Brick Co.....xii	<b>Pumps.</b> Rumsey & Co.....xi	<b>Pumping Engines.</b> Economic Gas Engine Co.....cover ii	<b>Railing Iron.</b> Manly & Cooper Mfg. Co.....iv	<b>Recording Thermometer.</b> The Draper Mfg. Co.....iv	<b>Reflectors.</b> I. P. Frink.....ii	<b>Roof Snow Guards.</b> John H. Hiller.....cover ii	<b>Roofing Paper, Etc.</b> M. Ehret, Jr., & Co.....cover iv H. W. Johns Mfg. Co.....cover ii The Standard Paint Co.....cover iv Warren-Ehret Co.....vii H. F. Watson.....cover iii	<b>Roofing Slate.</b> E. J. Johnson.....vi The Old Bangor Slate Co.....vi	<b>Roofing Tin.</b> Gumme, Sperring & Co.....cover iv N. & G. Taylor Co.....cover iv	<b>Roofing and Wall Tiles.</b> Canton Iron Roofing Co.....iv Cortright Metal Roofing Co.....xi The National Sheet-Metal Roofing Co.....xi The Standard Paint Co.....cover iv Thorn Shingle and Ornament Co.....iii	<b>Rustless Iron Water Pipe.</b> The Wells Rustless Iron Co.....v	<b>Sand Blast and Embossed Railroad Glass.</b> The Western Sand Blast Co.....iii	<b>Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Sash Lock.</b> Jenkins & Timby.....x The Champion Safety Lock Co.....x The Claffen Mfg. Co.....vii	<b>Saws.</b> Emerson, Smith & Co.....xiv Seneca Falls Mfg. Co.....ii	<b>Scroll Saws and Tools.</b> W. F. & J. Barnes Co.....ii Seneca Falls Mfg. Co.....ii	<b>Shade Roller.</b> Cushman Bros. & Co.....ii	<b>Shaking Grate.</b> Woodcock & Co.....x	<b>Sheathing Lath.</b> I. G. Jenkins.....x	<b>Shingle Stains.</b> Sam'l Cabot.....xiv Dexter Bros.....i	<b>Shutter Worker.</b> F. B. Mallory.....iii	<b>Skylights.</b> G. Hayes.....iv	<b>Slate Roofers' Supplies.</b> E. J. Johnson.....vi	<b>Sliding Blinds.</b> Hartman & Durstine.....x Wm. Willer.....x	<b>Stable Fittings and Fixtures.</b> S. S. Bent & Son.....iv	<b>Stair Iron.</b> Manly & Cooper Mfg. Co.....iv	<b>Steam Hot Blast Apparatus.</b> B. F. Sturtevant.....i	<b>Steam &amp; Hot Water Heating Engineers.</b> Danforth & Clark.....cover iii	<b>Tiles.</b> Chas. B. Kline.....v	<b>Tools and Machinery for Oil Wells.</b> Oil Well Supply Co.....iii	<b>Tools and Foot Power Machinery.</b> C. E. Little.....ii Seneca Falls Mfg. Co.....ii	<b>Tower Ornaments, Finials, Etc.</b> Thos. W. Jones.....vi	<b>Underground Cable.</b> Standard Underground Cable Co.....i	<b>Valves and Fire Hydrants.</b> Gloucester Iron Works.....v Mason Regulator Co.....xi Mellert Foundry & Machine Co.....cover iii Pancoast & Rogers.....viii	<b>Varnish.</b> F. W. Devoe & Co.....i Standard Varnish Works.....iii	<b>Vault Lights.</b> Manly & Cooper Mfg. Co.....iv	<b>Ventilating and Exhaust Fans.</b> Geo. P. Clark.....vi The Simonds Mfg. Co.....cover iv	<b>Wall Plaster.</b> Adamant Mfg. Co.....vii	<b>Water Heaters.</b> Instantaneous Water Heater Co.....iv	<b>Water Pressure Regulators.</b> H. Mueller & Sons.....iv	<b>Weather Strips.</b> J. Dunfee & Co.....vii Richmond Weather Strip Co.....xi	<b>Weather Vanes.</b> Thos. W. Jones.....vi	<b>Window Guards and Gates.</b> Composite Iron Works.....cover ii	<b>Window Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Window Shadings.</b> Oswego Shade Cloth Co.....cover iv	<b>Wood Carpet.</b> J. Dunfee & Co.....vii	<b>Wood Finishes.</b> Bridgeport Wood Finishing Co.....x F. W. Devoe & Co.....i Murphy & Co.....i D. Rosenberg & Sons.....iii	<b>Wood Mantels.</b> Keeler & Co.....xiii Mankey Decorative Co.....xii	<b>Woodworking Machinery.</b> F. H. Clement.....x J. O. Colladay & Co.....xii Connell & Dengler.....xii The Egan Co.....xii E. & F. Gleason.....cover iv Hoyt & Brother Co.....xii C. B. Rogers & Co.....iv Samuel J. Shimer.....iv	<b>Wrought Iron and Cement Lined Pipe.</b> Penna. Pipe Mfg. Co.....cover iv
--	---	--	---	--	---	--	--	---	--	--	--	---	---	--	---	---	--	--	---	--	--	--	---	--	--	--	---	---	--	---	---	---	---	--	-------------------------------------	--	--	--	---	--	--	--	--	--	--	--	-------------------------------------	--	---	--	--	---	---	---	--	---	--	---	---	--	--	---	---	--	---	--	---	--------------------------------------	---	--	---	---	---	---	---------------------------------------	---	--	--	--	--	---	---	--	---	---	---	--	--	--	--	---	---	---	--	---	--

**A VALUABLE BOOK**  
**ON PHYSICAL CULTURE**  
**FREE**  
**ON APPLICATION.**

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

**NARRAGANSETT MACHINE CO.,**  
**55 Sprague Street, Providence, R. I.**

HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH  
**CABOT'S CREOSOTE STAINS**



These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 30c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. **Send for Samples on Wood, and Circulars.**  
SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.



The Thomson-Houston Electric Co.

—MANUFACTURE—

THE ONLY PERFECT AUTOMATIC SYSTEM OF

# ARC AND INCANDESCENT LIGHTING

In the World.

*New illustrated pamphlet will be furnished on application.*

THE THOMSON-HOUSTON ELECTRIC COMPANY,

Principal Offices: 178 Devonshire St., BOSTON.

Western Offices: Pullman Building, CHICAGO.



## PRINCE'S METALLIC PAINT

An Indestructible Coating for

Iron, Tin and Wood.

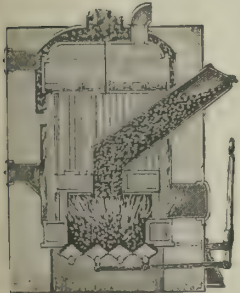
Will cover twice the surface at less than half the cost of lead.

But one color made, "Brown." Send for circular, to the sole manufacturers,

PRINCE MANUFACTURING CO.,

71 Maiden Lane, New York.

## The BRONSON Improved MAGAZINE Base-Burning STEAM HEATING BOILER.

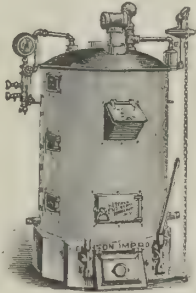


For Steam and Hot Water Heating. Automatic and Reliable. With Brick or Iron Settings, as you may prefer. The Bronson is constructed on scientific principles, the fire surface being of the best boiler tubing that can be obtained. This boiler exposes more water to the direct action of the fire, either in steam or hot water heating, than any boiler made. We are making a specialty of a High Grade All-steel Boiler, which we are anxious to place by the side of anything in the world for actual results. Reliable Agents Wanted. Send for Illustrated Catalogue and Price List.

WESTON ENGINE CO.,

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sale Agents, 40 Cortlandt Street, New York.



# Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.

SOMETHING NEW!

## Model Novelty Range.

Economy in Space, Fuel, and Labor.

No Brick Jambs or Lintel or Boiler Stand.

Horizontal Hot Water Boiler on Top of Range.

HOT AIR ATTACHMENT.

MANY OTHER FEATURES.

Architects, Builders, and Owners should see and call for the above Specialties for Dwellings or Apartment Houses.

ABRAM COX STOVE CO., PHILADELPHIA and CHICAGO,

EXPERTS AND SPECIALISTS IN HOT AIR AND RANGE SUPPLIES.

NEW YORK AGENCY:

WILKINSON & BANTA,

250 WATER STREET.



# ART STAINED GLASS

For Churches & Dwellings

Antique and Mosaic Work. Designs and Estimates on application.

William Reith,

134 N. 7th St., Philadelphia, Pa.



Cast Iron Pipe for Structural Work, Columns, etc. Flange Pipe and Specials.

STOP VALVES, FIRE HYDRANTS, LAMP POSTS. MELLERT FOUNDRY & MACHINE CO., Limited, READING, PA.

# Art \* Metal Work

BRASS LAMPS FOR CHURCHES. BRASS WORK FOR CHURCH ALTARS. BRONZE GRILLES FOR DOORS. WINDOW RAILINGS. ORNAMENTAL LANTERNS. BRASS RAILINGS FOR BANKS. METAL SIGNS.

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

# STAINED GLASS

MEMORIAL, CHURCH, AND DOMESTIC WORK.

C. H. POSTEL & CO.,

Branch Office, 527 Arch Street.

1314 RIDGE AVE., PHILADELPHIA.



ESTABLISHED IN 1845

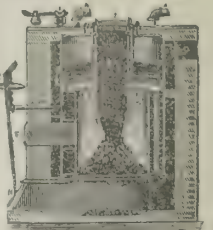
# ART STAINED GLASS,

F. J. RIESTER, Prop'r, Buffalo, N. Y.

## The Dunning Patent Wrought Iron Boiler. (Over 13,500 in use.)



THE Dunning Boiler, Self-Feeding, is the best for Low Pressure Steam Heating, and insures a warm house night and day. Free from Carbonic Acid Gas and Smoke. Made in eleven sizes, suitable to heat the smallest Cottage to the Largest Business Block, in five different styles: As a Magazine Boiler, which requires attention but once in twenty-four hours. As a Surface Burning Boiler, which will burn Hard or Soft Coal, Wood, Coke or Gas. As a Hot Water Boiler, for Green House and hot water heating. As a Portable Boiler, to be set without brickwork. Also in Two Sections, to pass through any door or window, where whole one cannot enter. Steam Engines and Boilers of all kinds and machinery generally. Manufactured at the New York Central Iron Works, Geneva, N. Y., U.S.A. LOCK BOX 40. Send for New Illustrated Catalogue.



Trade Mark.

# STEAM and HOT WATER HEATING ENGINEERS

Correspondence Solicited.

Danforth & Clark, Buffalo, N. Y.



## WE SELL ALL AMERICAN BICYCLES.

And guarantee LOWEST PRICES. A. W. GUMP & CO., Dayton, O. Largest retail stock in America.

52 in. OTTO, factory price \$60.00, our price \$40.00.  
50 in. " " " 55.00, " " 35.00.  
48 in. " " " 50.00, " " 33.00.  
46 in. " " " 45.00, " " 30.00.  
44 in. " " " 40.00, " " 27.00.  
Order quick. Also 250 second-hand Wheels, Repairing & Nickeling. Bicycles & Guns taken in trade.



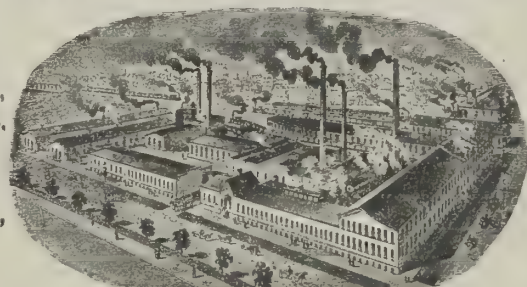
SURVEYING INSTRUMENTS. ARTISTS' MATERIALS.

# KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

## BUILDING PAPERS.

ROSIN SIZED and WATERPROOF SHEATHINGS, DEADENING FELTS, PLAIN and CORRUGATED CARPET LININGS, ASBESTOS SHEATHINGS, Etc.



2 and 3 PLY PREPARED ROOFING, TARRED ROOFING FELTS, ROOFING MATERIALS, Etc., Etc. Send for Samples and Prices.

ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.

H. F. WATSON, MFR., ERIE, PA.

CHICAGO, ILL., Office, 86 Washington St.

NASHVILLE ROOFING & PAVING CO., Nashville, Tenn.

LIBBY & WILLIAMS PAPER CO., St. Louis, Mo.

# Warren-Ehret Co., ROOFING

—MANUFACTURERS OF—

OF ALL KINDS.

BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc. Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

—WORKS:—

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you  
get the quality and brand wanted?

Because every PERFECT SHEET of the  
following three extra fine guaranteed  
brands of Roofing TIN IS STAMPED at  
the works with the name of the brand and  
the thickness. Please note this.

"Old Style." Extra Heavily Coated.  
The Best Made.

"Westminster." Re-dipped. Made  
from Heavy Iron.

COCKLEY K Highest Grade of  
Heavy Regular Coated.

EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and  
full information given.

**N. & C. TAYLOR CO.**  
Established 1810. 77th year.  
**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



**PHILADELPHIA,**  
423 Walnut Street.

**ST. LOUIS,**  
113 North 8th Street.

**CHICAGO,**  
50 Dearborn Street.

ANYBODY CAN PUT IT ON.  
EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY  
**M. EHRET, Jr., & CO.,**

## THIS "FLORIDA" HEATERS

TRADE MARK.

FOR STEAM HEATING,

16 Sizes—Magazine Feed for Hard Coal or Coke.  
16 Sizes—Surface Feed for Soft Coal, Wood or Gas.

For Hot Water Heating.

15 Sizes—Magazine or Surface Feed. Adapted to  
any fuel.

IN WARMING

**Suburban Homes**

The "Florida" has an established reputation. Its  
use insures uniform temperatures day and night.  
They are first-class in every respect, reliable, dur-  
able, and give best results in economical use of  
fuel, many thousands being in use. Descriptive  
book and references mailed free.

Address the Sole Manufacturers,

**Pierce, Butler & Pierce Mfg. Co.,**  
**SYRACUSE, N. Y.**

Estimates free. Satisfactory results guaranteed.



## YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,

SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**THE P&B**

IDEAL ROOFING,

SHEATHING and INSULATING PAPERS.

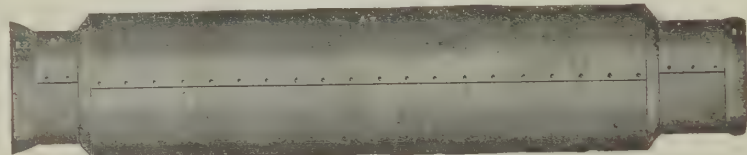
Electrical Compound, Farmers', Brewers',  
and Preservative Paints. Please mention this paper



## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.



Pipe complete and ready for the trench.

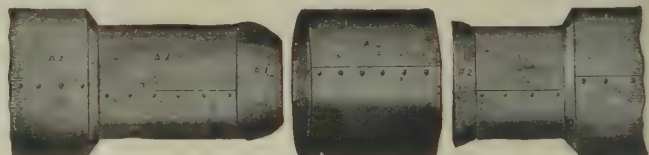
It is designed for

Public Works,

Public Buildings,

—AND—

Private Dwellings.



Wrought iron sleeve and the male and female ends before connecting for jointing.

MANUFACTURED BY THE  
**PENNSYLVANIA PIPE MANUFACTURING CO.,**  
Germantown Junction, Philadelphia, Pa.

## Architects, Roofers, Builders. "Alderly" & "Pennsyl" Old Method Roofing Plate

THE TWO BEST BRANDS OF GUARANTEED ROOFING PLATES. NO BETTER PLATES MADE.

"ALDERLY," Made of Siemens-Martin Soft Steel. Only Perfectly Square Plate. Perfectly Sorted.

"PENNSYL," OLD METHOD TREBLE COATED ROOFING PLATE. Guaranteed to Stand Any Test. Heaviest Coated.

SEND FOR SAMPLE BOXES OF THESE CELEBRATED ROOFING PLATES.

SOLE MANUFACTURERS of the "PATTEN" METALLIC ROOFING SHINGLES. BEST MADE.

**GUMMEY, SPERING & CO.,**

Philadelphia—Liverpool.

## STAINED GLASS

For Churches and Private Dwellings, etc.

**JEWELLED MOSAICS.**

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WOOD WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.

## WINDOW GLASS.

Malaga Glass & Mfg. Co.,

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

MALAGA AND MILLVILLE, N. J.

OFFICE,

400 CHESTNUT ST., PHILADELPHIA.



"GIANT" PORTLAND CEMENT,

"EGYPT" PORTLAND CEMENT,

"IMPROVED UNION" CEMENT,

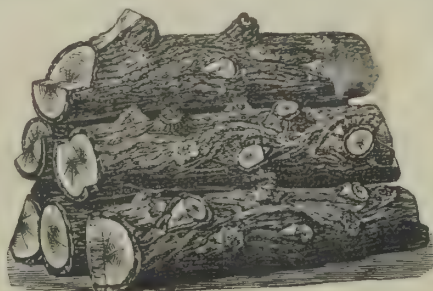
"UNION" CEMENT.

**LESLEY & TRINKLE,** Sales Agents, 216 South Third St., Phila.

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

Manufacturers,

1330 Chestnut St., - Phila., Pa.

## SHAW & GEARY,

MANUFACTURERS & DEALERS

**ELECTRICAL APPLIANCES.**  
53 No. Seventh St., PHILADELPHIA.



In ordering your Window Shadings specify

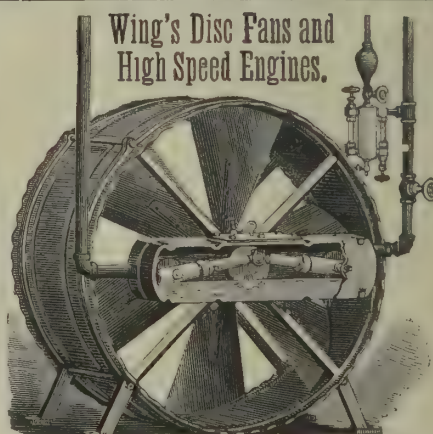
**"CHOUAGUEN,"**

AND TAKE NO OTHER.

See Trade Mark.

Are the Best Finished, Most Uni-  
form, and Most Durable  
Goods made.

ENQUIRE OF ANY DEALER.

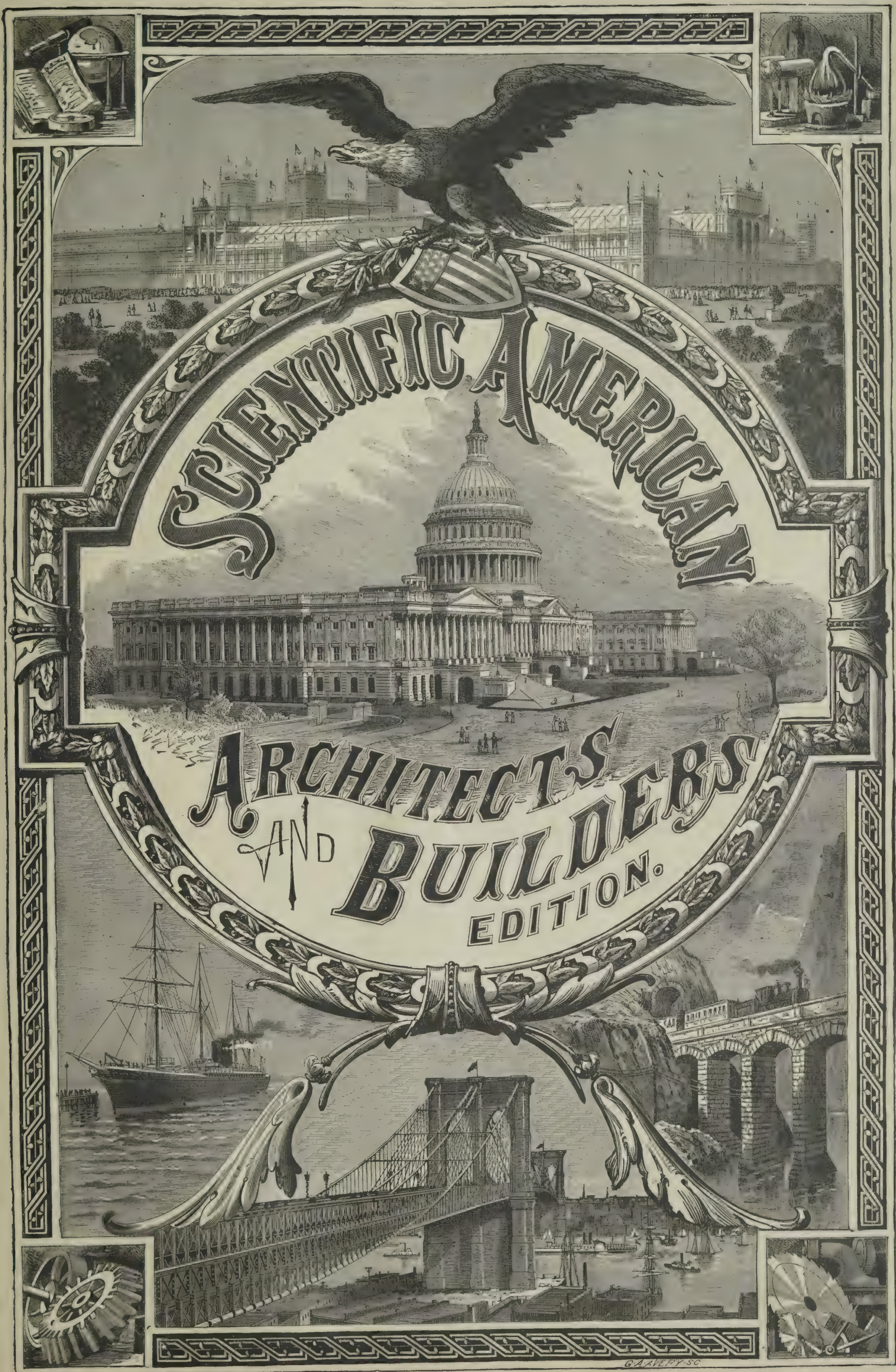


Gold and Silver Medals taken over all other  
Fans.

THE FAN BLADES ARE ADJUSTABLE, and being  
inside of a framework and made of the very  
best material, are perfectly safe. The Fan is noise-  
less, simple, and strong, and will move more air for  
the power used than any Fan in the world. The  
Engine is a great success, and the combination a  
valuable adjunct to Mills, Factories, Tanneries,  
Schools, etc., for drying, heating, cooling, ventilat-  
ing, removing of steam, dust, etc.

Fans furnished for Belting, Electric Motors, etc.  
**The Simonds Mfg. Co., 50 Cliff St., New York.**  
Send for Illustrated Circulars, Prices, etc.





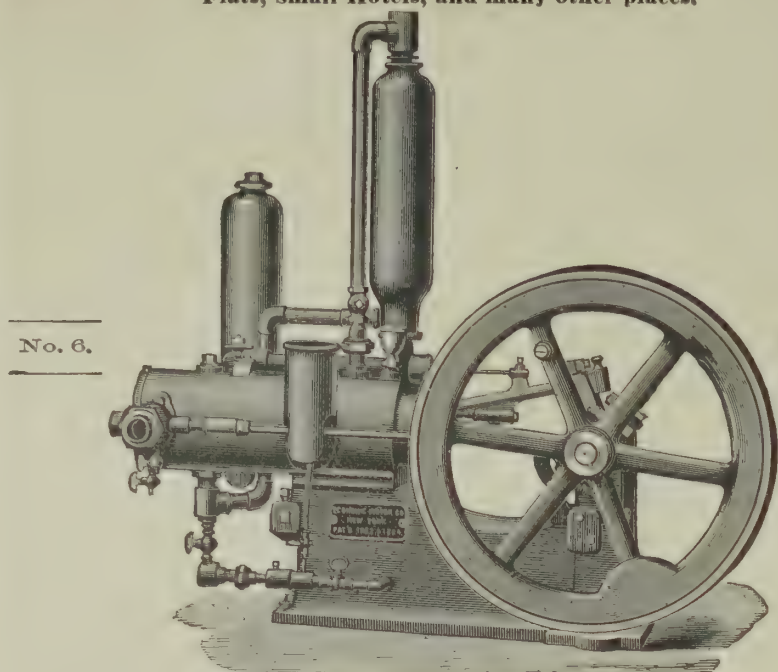


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra Insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



No. 6.

1 Man.

Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

- No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.  
No. 8. One Horse, - 1,500 " " " "

## GASOLINE GAS ENGINES.

15. One Man, - 300 Gallons, 50 feet High, per Hour.  
16. One-Half Horse, 600 " " " "  
18. One Horse, - 1,500 " " " "

Our Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power. Our Gas Engines will work satisfactorily when attached to Gasoline Machines. SEND FOR ILLUSTRATED CATALOGUE.

Economic Gas Engine Co.,  
Office and Salesroom, 34 DEY ST., NEW YORK.



IN OFFICE BUILDINGS, with U.S. Mail Chutes, (pat'd), and the U.S. free collection service, tenants mail letters without going down stairs. Write for particulars. The Cutler Mfg. Co., Rochester, N.Y., Sole Makers.

Are you building a new home? Make it beautiful.

STAINED and LEADED GLASS. For Public and Private Buildings. Send for Price List.

## BRAY'S PATENT GLASS MOSAIC

Is the handsomest, best and cheapest

STAINED GLASS!

and far superior to ordinary leaded glass for Door Panels, Transoms, Fire Screens, Hall Lanterns, and all the uses of modern Glass Work.

Illustrated Catalogue on application. Beacon Stained Glass Works, 35 & 37 Province St., Boston, Mass.

Are you erecting a new church? Have it attractive.

## THE OTIS TUBULAR FEED WATER HEATER



With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of

## ELEVATOR PUMPS,

both Passenger and Freight, to heat the Feed Water for the boilers.

We guarantee one square foot of heating surface per horse power. We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.

MANUFACTURED BY

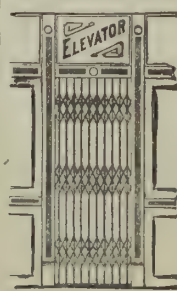
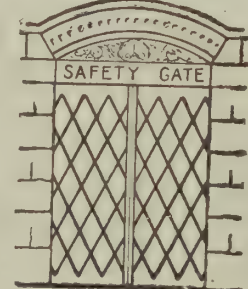
Stewart Heater COMPANY,

40 & 42 Clinton Street, BUFFALO, N. Y.

## COMPOSITE IRON WORKS CO.

83 Reade Street, New York.

Established 1847.

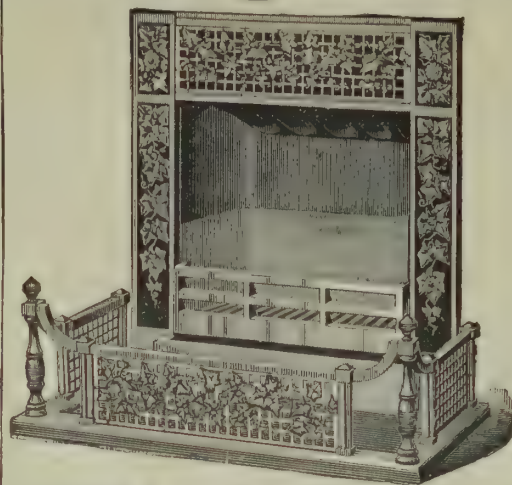


## Artistic Iron Work —FOR— BUILDINGS.

Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



# THE JACKSON Ventilating Grate & Fireplace Furnace



HEATING ON ONE OR TWO FLOORS  
200 DIFFERENT STYLES.

## NINETY

of these Grates ordered for the New Court House at St. Paul, Minn.

## SIXTY

in use in Columbia College, New York.

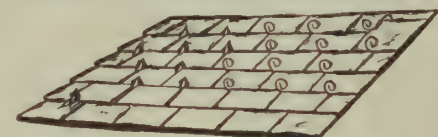
Send for Catalogue F.

EDWIN A. JACKSON & BRO., 50 Beekman St., New York.

ARCHITECTS, BUILDERS!  
ATTENTION IS CALLED TO  
ADVERTISEMENT ON PAGE iii  
FRANK B. MALLORY.

SPECIFICATIONS SHOULD INCLUDE

Folsom's Patent Roof Snow-Guards

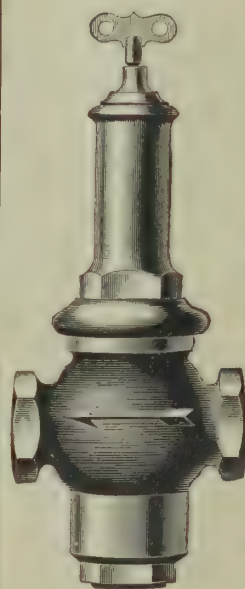


Address, —300,000 IN USE.—  
JOHN H. HILLER, 1408 Tremont St., Boston.

Solid Braided Cotton Sash Cord.



The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers.  
J. P. TOLMAN & CO., 164 High Street, Boston, Mass.



## OUR REDUCING VALVE

Is the standard used by the American and Southern Cotton Oil Companies and all the Sugar Refineries.

MASON REGULATOR CO., BOSTON.

Steam Regulating Devices.

# SCHUMACHER & ETTLINGER, LITHOGRAPHERS,

32, 34 and 36 Bleecker and 311 Mott Streets

NEW YORK.

FINE COLOR WORK A SPECIALTY.

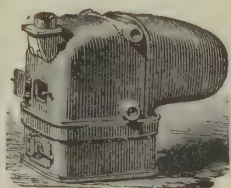
# Dwelling-Warming Hot-Water System.

HITCHINGS & CO.,

233 MERCER STREET, N. Y.

—ALSO—

# Greenhouse Heating and Ventilating Apparatus.



Estimates of cost furnished on application.

SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.



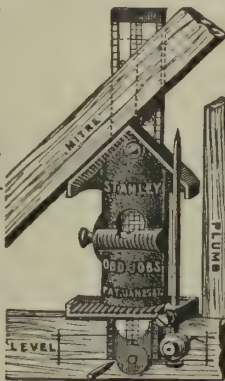
This Tool embraces in itself and in combination with an ordinary Carpenter's Rule:

- (1) Try Square.
- (2) Mitre Square.
- (3) T-Square.
- (4) Marking Gauge.
- (5) Mortise Gauge.
- (6) Depth Gauge.
- (7) Spirit Level.
- (8) Beam Compass.
- (9) Inside Square for making boxes and frames.

STANLEY Rule & Level Co.  
NEW BRITAIN, CONN.

SOLD BY ALL

Hardware Dealers.



## Stanley's "Odd-Jobs."

Attach the Tool to a Rule, making a try-square, or a T-square with long or short tongue; also, a right or left hand mitre-square. The pointed steel rod is a scratch-awl.

A marking gauge is made by setting the point, or pencil, at any required distance from the square end of the stock. A mortise-gauge, also, by inserting an additional point, or pencil, in the angle at head of the Rule. A graduated depth-gauge is furnished by extending the Rule down from the square end of the stock.

The steel point at mitred end of the tool forms a center, from which a circle can be swung, (as with a beam compass) 1-2 to 13 inches in diameter. For small circles, reverse the steel rod, to bring the pencil nearer the center-point.

A circle of 25 inches diameter can be swung, if the Rule alone is used, with a pencil in the angle at its head.

No. 1. Odd-Jobs, Nickel Plated, with Level, \$0.75



# SCIENTIFIC AMERICAN

Entered at the Post Office of

New York as Second Class Matter.

ARCHITECTS

AND BUILDERS

EDITION.

Vol. VI. Subscription, \$2.50 a Year.

NEW YORK, SEPTEMBER, 1888.

Single Copies, 25 Cents.

No. 3.



A RESIDENCE AT ROCHELLE PARK, NEAR NEW YORK.

[For description see page 47.]



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

NEW YORK, SEPTEMBER, 1888.

THE  
Scientific American,  
ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

Bound Volumes.—Two volumes are published annually. Volumes 1, 2, 3, and 4, which include all the numbers of this work from commencement to close of 1887, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,  
361 BROADWAY, NEW YORK.

For additional information concerning any of the plans or buildings illustrated in these pages, address MUNN & Co., as above.

CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN & Co., Publishers, 361 Broadway, New York.

CONTENTS

Of the September number of the ARCHITECTS AND BUILDERS EDITION of SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

Barn, how to build*.....	63	House on Jersey City Heights*.....	46
Bronze, ancient use of.....	46	House on Jersey City Heights, details*.....	60
Chimneys, high, oscillations.....	65	Kitchen, model, Boston.....	65
Cottage, \$1,000*.....	55	Larch, veneration.....	66
Cottage, \$1,600*.....	54	Lime, slaked, effect of time on.....	56
Cottage, \$2,500*.....	62	Material, building, corrugated metal.....	66
Cottage, \$2,800*.....	56	Moth, buffalo, sure death to.....	46
Cottage, basement*.....	58	Optics, experiment in.....	46
Cottage, modern, for \$1,800*.....	51	Ornament, imitative and conventional.....	65
Cottage, Queen Anne, at Rochelle Park, N. Y.*.....	49, 50	Painting, roof.....	66
Cottage, seaside*.....	50	Paints, liquid, H. W. Johns.....	65
Dwelling of moderate cost*.....	46	Plans, elevations, etc.....	51
Dwelling of moderate cost, details*.....	59	Residence at Nangle*.....	64
Fans, ventilating, improved*.....	65	Residence at Rochelle Park, N. Y.*.....	45, 47
Finish, interior.....	65	Residence at Rochelle, N. Y.*.....	48
Floor plans for dwelling of moderate cost*.....	52	Residences and hotels*.....	61
Floor plans for house on Jersey City Heights*.....	52	Rose jar.....	35
Furniture, artistic*.....	66	Sewers, disinfection of.....	55
Glass, bent, for circular fronts and towers.....	66	Slates, roof.....	65
Heaters, steam and hot water, Florida*.....	66	Stains for coloring and tinting mortar.....	66
House, colonial, Rochelle Park, N. Y.*.....	46, 58	Tale, a moving.....	51
House, double, \$4,500*.....	57, 58	Trees, ornamental, planting.....	54
		Trick, plumber's, a new.....	64
		Troughs, seamless eaves*.....	65

A DWELLING OF MODERATE COST.

One of our colored plates this month illustrates a comfortable dwelling, estimated to cost \$1,950. It has a front of 21', including bay; side 39' 6", not including veranda.

Height of stories, cellar 7'; first story 9'; second story 8' 6"; attic 8', all in the clear.

Cellar 8" brick wall; first and second stories clapboards. Front and one side gable, and space between windows on bays shingled.

There are sliding doors between parlor and dining room. Two nice closets in dining room. Cellar stairs from kitchen. Nice large pantry off kitchen. There are three chambers on second floor. The small one may be used as a bath room if desired. Two good size bedrooms can be made in the attic. For the floor plans see page 52, and for the plate of details see page 59.

A HOUSE ON JERSEY CITY HEIGHTS.

One of our colored plates shows an elegant and substantial dwelling lately erected on Jersey City Heights, opposite New York, from plans and specifications prepared in the architectural bureau of the SCIENTIFIC AMERICAN. In order to produce the many plans and illustrations that are used in this publication, we employ a staff of able architects, and we can readily supply those of our readers who contemplate building, with complete plans, specifications, and details, not only of the various buildings we publish, but any other structures required. Our terms are moderate. Hundreds of buildings have been erected from our plans.

This house has a front of 41' not including dining room bay. Side 50' 3", not including verandas.

Height of cellar 8'. First story 11'. Second story 10'. Attic 8'.

The foundation cut stone. First and second stories clapboards, gables paneled and shingled.

Roof black slate, with terra cotta ridges.

The hall is large and not obstructed by the stairs. The rooms can be thrown together by wide sliding doors. Large open fireplaces in parlor, library, dining room and two chambers. The dining room, hall, butler's pantry, and kitchen have hard floors. The water closet adjoining, but separate from, bathroom. The attic is entirely finished. There is a large loft for storage, with stairs to same. Main staircase is constructed of quartered oak.

Finished in good style throughout, this house will cost \$14,000. For the floor plans see page 52. For plate of details see page 60.

Ancient Use of Bronze.

In reading the travels of Pausanias in Greece, we cannot but feel surprised at the immense number of bronze works in sculpture which he meets with at every step, particularly when we recollect that the country had been in the possession of the Romans for three centuries, and that they had already, on several occasions, carried away thousands of bronze figures. Of thirty-three colossi described by the tourist, thirty were of bronze, the three others of wood; he also describes thirty-two equestrian statues of bronze and twenty-four chariots, at least of natural size, sometimes with two and oftener with four horses, and holding one or two figures. Some were accompanied by runners or grouped with men on foot who led them; in fine, he mentions more than forty animals of considerable size, also of bronze. And yet Pausanias only visited a part of Greece. It was of bronze that the Athenians, after the death of Pisistratus, formed the first quadriga, in memory of their fellow countrymen who died while fighting for their native land. The Romans made frequent use of bronze, and, like the Greeks, employed it in the form of candelabra, lamps, furniture, triclina, altars, tripods, tools, fastenings, letters for monumental inscriptions, window fastenings, etc. The doors were sometimes plated with bronze, secured with nails of the same metal; such as those of the Pantheon. Pliny (B. 34, sec. 7) says that the ancients were accustomed to make the threshold and gates of temples of bronze. Ancient gates entirely formed of bronze are still to be seen in the church of St. Cosmo and St. Damian in the Forum at Rome, formerly the temple of Romulus and Remus, and this luxury was not exclusively confined to temples, for, 380 years before our era, the ornaments were of bronze on the doors of the house of Camillus. By means of cramps large masses of bronzed ornaments and carvings were fastened on monuments by way of decoration. On bronze tablets were engraved laws, treaties of peace, and public acts intended to be made known to posterity. Three thousand of these tablets were destroyed in the fire of the capitol, in the time of Vespasian. Capitals were also made of bronze, which were secured on cores of stone. Pliny relates that "C. Octavius, who conquered Perseus in a naval action, erected in honor of his triumph a double portico, which was called Corinthian, because the capitals of the columns were of bronze; this portico was near the Flaminian Circus; the capitals of the Pantheon, placed there by Agrippa, are of the same metal." The Romans further applied bronze in the execution of works on a large scale; the framing of the Pantheon

was constructed of bronze, and, according to Serlio, who had examined it in its place, the different pieces were hollow; they were put together in the same way as woodwork. The caissons of the vault of this monument were also of bronze, and the circle which frames the opening by which the rotunda is lighted still remains. In the baths of Caracalla the ceiling of the immense hall known as the Cella Soloris was formed of a network of bronze; a fact of which M. Blouet did not seem to be aware when he published his restoration of that monument. The ancients also constructed roofing of bronze, for, 212 years before the Christian era, the temple of Vesta, at Rome, was covered with tiles of bronze, and so, at a later period, was the Pantheon. As to the bronze statues, there was at Rome a number truly prodigious, brought from all the great cities of Etruria, Greece, Sicily, and Asia Minor. Scavrus having erected a temporary theater at Rome, toward the end of the republic, decorated it with three thousand of these statues.—C. Daly.

COLONIAL HOUSE, ROCHELLE PARK, NEW YORK.

Our engraving, which is made direct from a photograph of the house taken specially for the SCIENTIFIC AMERICAN, shows a beautiful house in the Colonial style in Rochelle Park, New Rochelle, New York. The building is situated on the main drive and facing the lawn. It was lately erected, at an expense of \$10,000 complete.

The arrangement of the interior is excellent and the elevations attractive.

It is built throughout in the best manner, and complete in all of its appointments.

There is a cemented cellar under whole of house, is well lighted and contains wood, coal, and vegetable cellars, furnace room and laundry, provided with wash trays, hot and cold water, etc.

Foundation of stone and underpinning of brick.

The exterior is covered with white pine shingles, laid plain in the old fashioned way.

Enter by crossing a pretty piazza through a vestibule, into a large hall, leading to all rooms.

There is a studio at rear of back parlor, with two large windows, giving ample light.

The parlors are large, finished in cherry. There are large open fireplaces, with Tiffany brick hearths and artistic cherry mantels.

The hall has a very pretty staircase, with carved newels and spindle balusters and rail, all out of oak. A window on staircase gives plenty of light.

The rest of the woodwork in hall is of oak.

The dining room is very pretty, having fireplace and a neat mantel.

The rest of the inside woodwork is of white pine finished in natural wood.

The kitchen is provided with range. Sink neatly cased up and one shelf under.

The pantry is fitted with shelves, and butler's pantry is fitted up complete with drawers and shelves besides a butler's sink and glass cupboard.

There are four large and cheerful bedrooms on second floor, besides bath room and linen closet.

The bedrooms are provided with movable wardrobes and the three principal ones have open fireplaces and neat wood mantels.

The bath room is provided with tub, wash bowl, and water closet, supplied with hot and cold water.

Linen closet is provided with tiers of shelves.

The servants' staircase leads from cellar to attic, which has two rooms finished off besides trunk rooms.

The principal rooms have hardwood cornices and centers, and the floors are laid of hardwood also.

The house is piped for gas.

The exterior of this house is very odd in appearance, and is not to be painted.

The shingles are to be allowed to bleach out to a silvery color.

An Experiment in Optics.

A workman in a German factory claimed that through an accident, while employed in his daily labor, he had lost the sight of his left eye, and brought suit against his employers for damages. Experts pronounced the eye sound and uninjured. To prove this, words were written upon a blackboard with green ink, and the plaintiff desired to put on a pair of spectacles, of which the glass for the left eye was plain white, that for the right being red. He was requested to read the writing, which he did without hesitation, thus convicting himself of fraud, as he had seen with the left eye only, it being well known that the red glass for the right eye would change the green to black, rendering it invisible. Thus does science sometimes triumph over ignorance.

Sure Death to Buffalo Moths.

A lady correspondent sends us the following: Take strips of red or blue flannel (as these colors are particularly attractive to them), dip in liquid arsenic and lay around the edges of carpets, or wherever the pests are troublesome. They will soon eat a desired amount, and collapse to the entire satisfaction of the housewife, without the least injury to her carpets.



A RESIDENCE AT ROCHELLE PARK, NEAR NEW YORK.

In Rochelle Park, facing the lawn and the main entrance, this beautiful residence, of which we give a perspective and floor plans, was lately built by Mr. Brown, at a cost of \$9,272, complete. The engraving on first page is a near view of the house. The illustrations on this page show the floor plans and a distant view of the house.

One of the features of the exterior is the broad piazza, which runs across front and returns at side, and the balconies on second floor. The roof is very pretty, with graceful eye windows and little gables, all being in good proportion.

The bay window projection to bed room over dining

room is carried out on neat ornamental wooden brackets.

There is a cemented cellar under whole of house, which contains coal and wood cellars, besides furnace room and laundry, with wash trays, supplied with hot and cold water.

The first story is covered with clapboarding and the second is covered with cut shingles.

The roofs throughout are shingled.

The first floor contains hall, parlor, library, dining room, kitchens, and pantries. On the second floor are four bed rooms, den and bath room, two servants' rooms, trunk room and billiard room in attic.

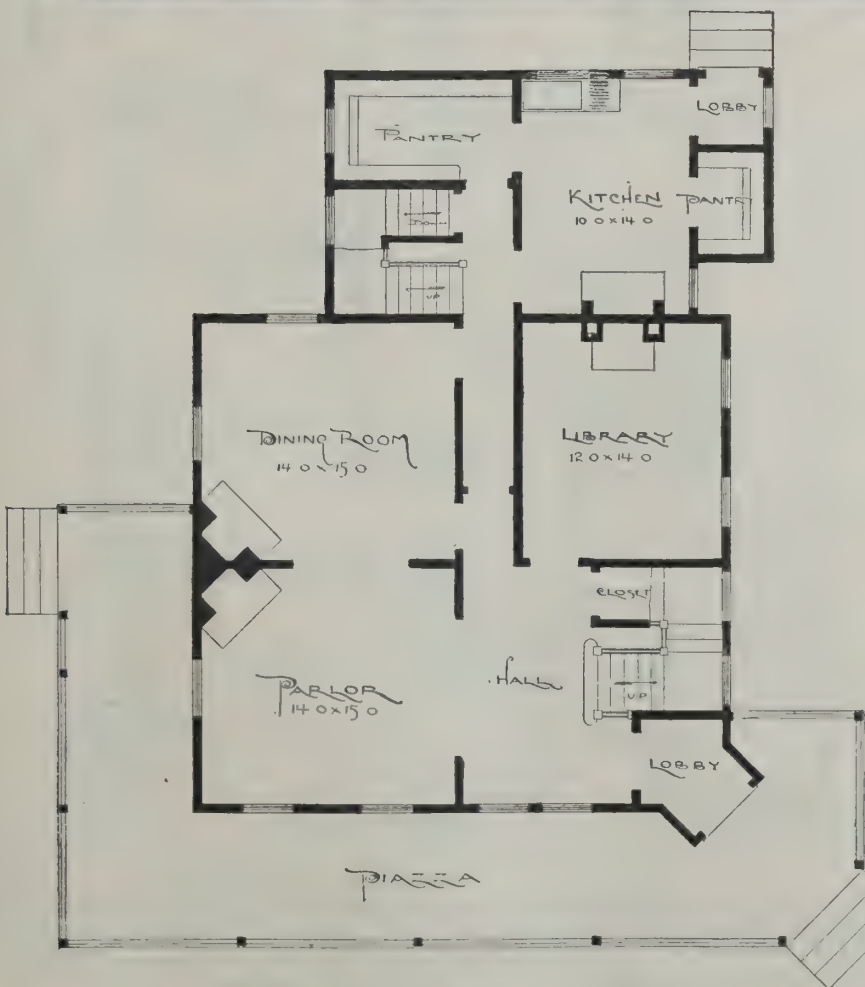
The entrance lobby is neatly paneled, four feet high,

as wainscot, and finished with a heavy moulded cap. All the rooms are of good size, and the trim throughout is of solid cherry, with all door and window casings beaded and band moulded.

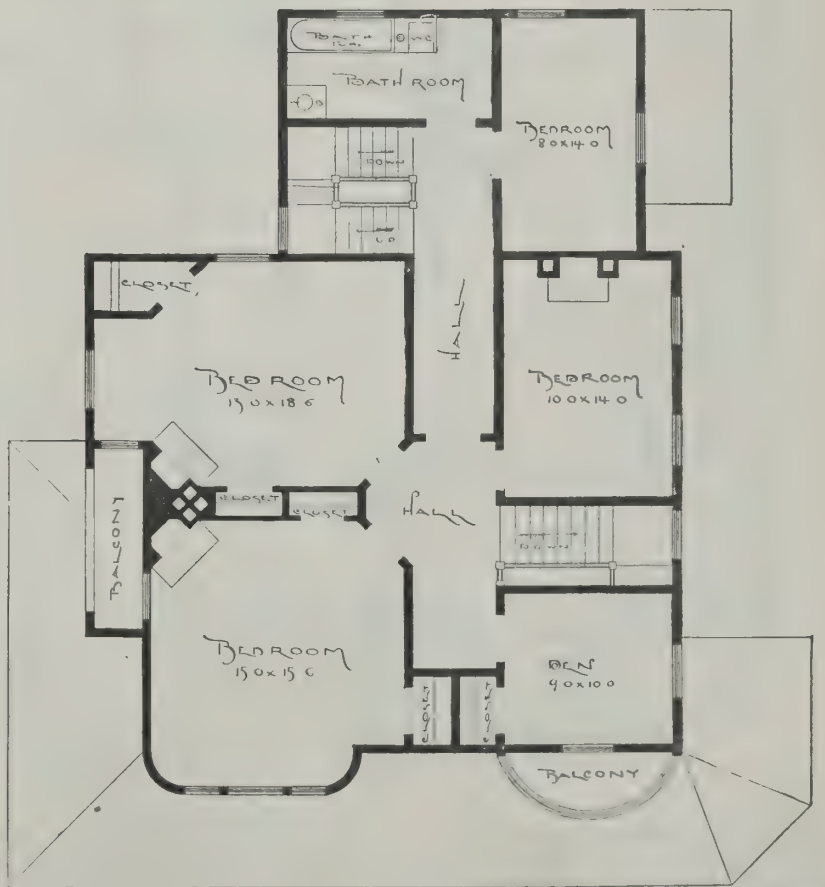
The hall has a grand staircase, which leads to second floor, with newels, posts, balusters and rail, all neatly turned, of cherry, and a pleasant window on stair landing gives plenty of light.

The parlor and dining room are well lighted, have open fireplaces, with neatly laid tile hearths and pretty and artistic hardwood mantels, furnished with plate glass mirrors.

The library room is pleasant and has a neat open fireplace, with tile hearth and mantel fitted up com-



FIRST FLOOR



SECOND FLOOR

RESIDENCE AT ROCHELLE PARK





plete. All the principal rooms have hardwood floors and arches.

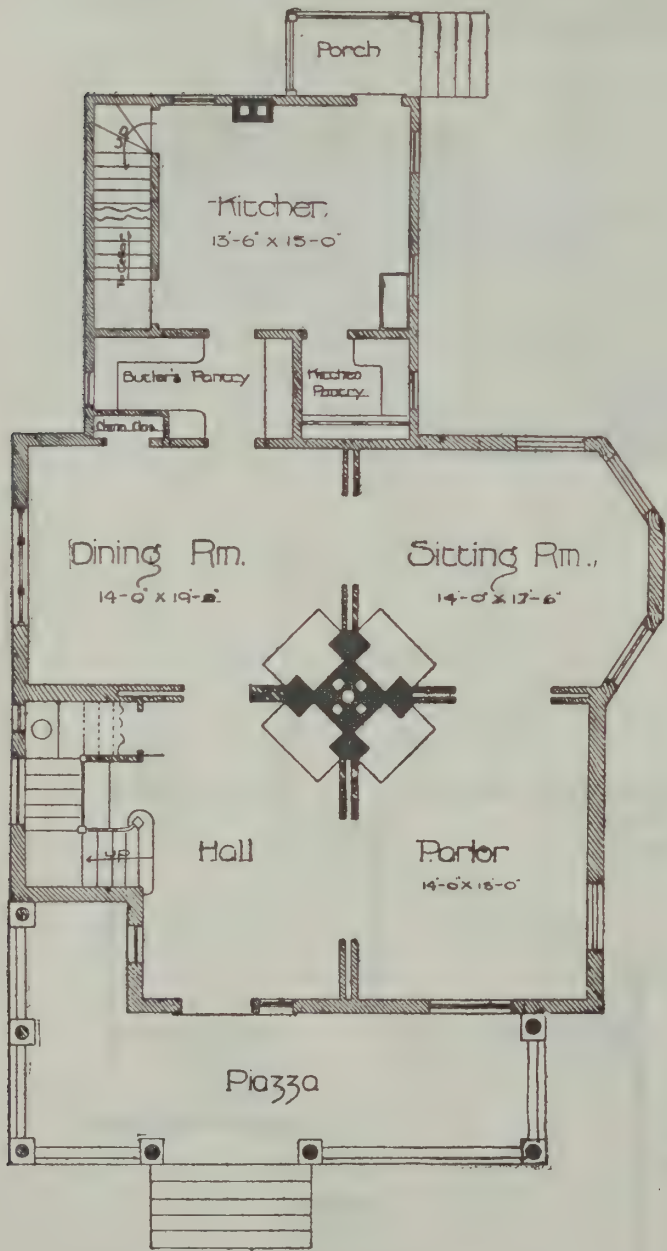
A passage from front hall leads to kitchen, butler's pantry, and rear staircase, which is an open one, with neatly turned newels, posts, balusters and rail, and runs from cellar to attic.

with shelves and wardrobe hooks on neat strips, etc. The bath room is neatly wainscoted and is provided with wash bowl, bath tub and water closet, all supplied with hot and cold water.

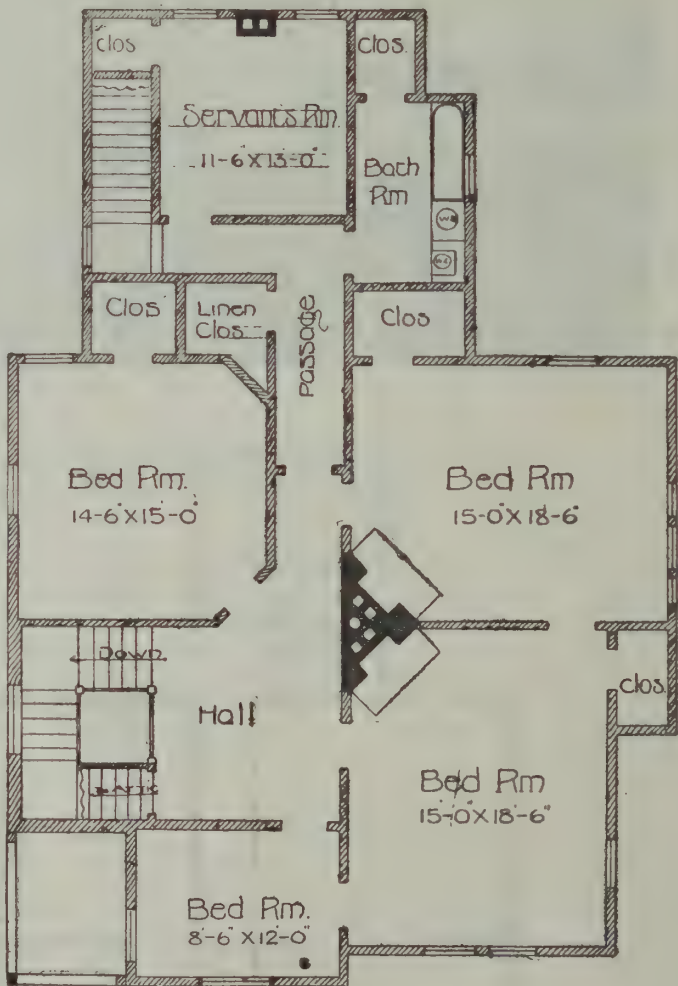
The billiard parlor in attic is neatly finished, and is wainscoted and finished with a heavy moulded cap

and the interior finish is very handsome. Our engravings were made direct from photographs taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT ROCHESTER, N. Y.  
We give, from the *Architectural Era*, the perspective



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

A RESIDENCE AT ROCHESTER, N. Y.

The kitchen pantries, butler's pantry, and lobby are neatly wainscoted, three feet high, with narrow beaded white pine, and finished with a neat cap.

The bedrooms are all large and conveniently arranged, and have neat fireplaces, with tile hearths and artistic mantels.

Ample closet room is provided, and neatly fitted up

The ceilings are neatly corniced and artistic flower pieces are provided for the centers. The house is provided with gas.

It is painted a light gray color, and the roof is painted an Indian red.

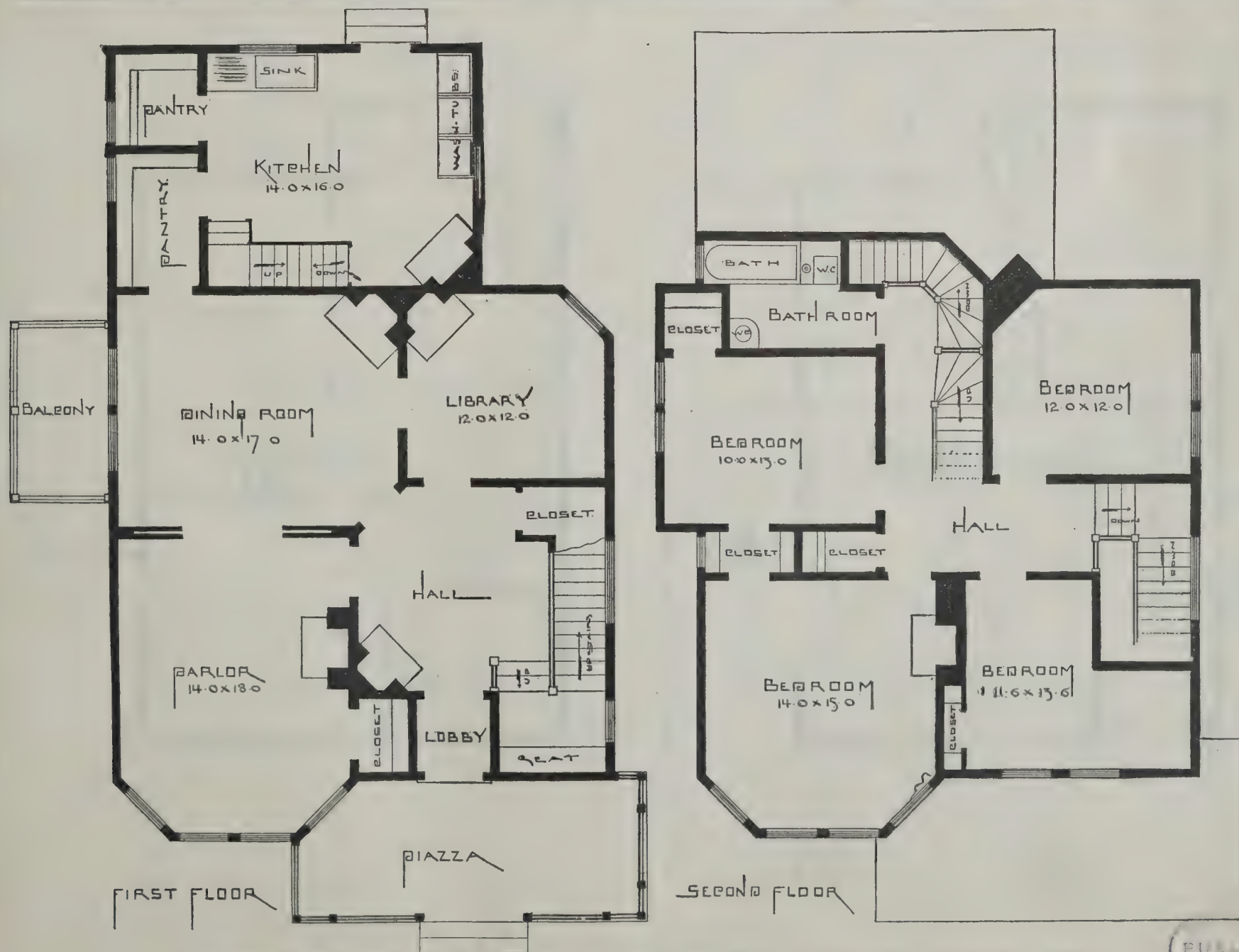
This house is attractive in appearance, the elevations are all pleasing, the internal arrangement is complete,

and floor plans of the residence of I. C. Goodridge, Esq., Rochester, by Jay Fay and O. W. Dryer, architects. It is a pleasing, well arranged, and comfortable house.

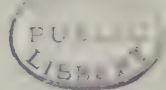
ONE teaspoonful of ammonia to a teacupful of water, applied with a rag, will clean silver or gold jewelry.







A QUEEN ANNE COTTAGE IN ROCHELLE PARK, NEAR NEW YORK.—[For description see page 50.]





A SEASIDE COTTAGE.

Situated on the main drive in Bath Beach, Long Island, and adjoining the Avon Beach Hotel, is the beautiful little seaside cottage shown in our photographic engraving.

It has a very picturesque appearance, with its odd shape bay windows and roof. It has a broad piazza overlooking the ocean.

On first floor there is a parlor and dining room, bedroom, and hall with stairs, and attic, with a staircase bay with seats at first landing.

The second floor has four airy bedrooms, with plenty of closet room, fitted up in the best manner. There are three bedrooms in attic, finished in a neat manner.

The house has a basement, which is provided with kitchen and cellar. Kitchen has range, sink, and wash-trays, neatly cased up, and supplied with hot and cold water.

A dumb waiter is provided between kitchen and dining room.

A bath room can be provided, if desired. It can be placed in the basement or can be put in front hall bedroom, second floor.

Parlor and dining room have open fireplaces, with tile hearths and neat ornamental hardwood mantels, mirror, etc.

The inside trim throughout is of North Carolina pine, finished in natural wood.

The door and window casings are beaded.

The newels and balusters and rail are very neatly turned, and are of yellow pine, finished in the natural wood.

The parlor, dining room, and hall are neatly corniced, and center pieces of tasty designs are provided.

The house is piped for gas.

There is a stone founda-

tion, with brick underpinning. The first story is covered on the exterior with clapboards and the second story with cut shingles. Shingle roof.

This house cost about \$2,500.

Our engraving was made direct from a photograph of the house taken specially for SCIENTIFIC AMERICAN.

A QUEEN ANNE COTTAGE IN ROCHELLE PARK, NEAR NEW YORK.

On the Winyah Avenue drive and facing the lawn in Rochelle Park, New Rochelle, N. Y., is this pretty and attractive Queen Anne cottage, which has been lately built for Mr. Acker, at a cost of \$5,600.

The design is executed in a thorough, workmanlike

manner, and has a plan that is arranged to advantage, while the elevations are attractive.

There is a cellar under whole of house, which is cemented and contains coal and wood cellars, also furnace room, provided with a steam heater.

The foundation is of stone and the underpinning is of brick.

The chimneys are artistic, and form an architectural feature.

The exterior is covered with clapboards and shingles.

On the first floor there is a pretty piazza, which runs across front, a large hall, parlor, dining room with two large windows, which open out upon a pleasant balcony, besides a library and kitchen.

On the second floor there are four good sized bedrooms and bath room, and there are two rooms and trunk room in attic.

The hall has a pretty staircase, with a landing, containing a cozy seat and a pleasant window, with newels, post and balusters and rail neatly turned.

The rooms have open fireplaces, furnished with tile hearths, dog irons, and neat, artistic hardwood mantels.

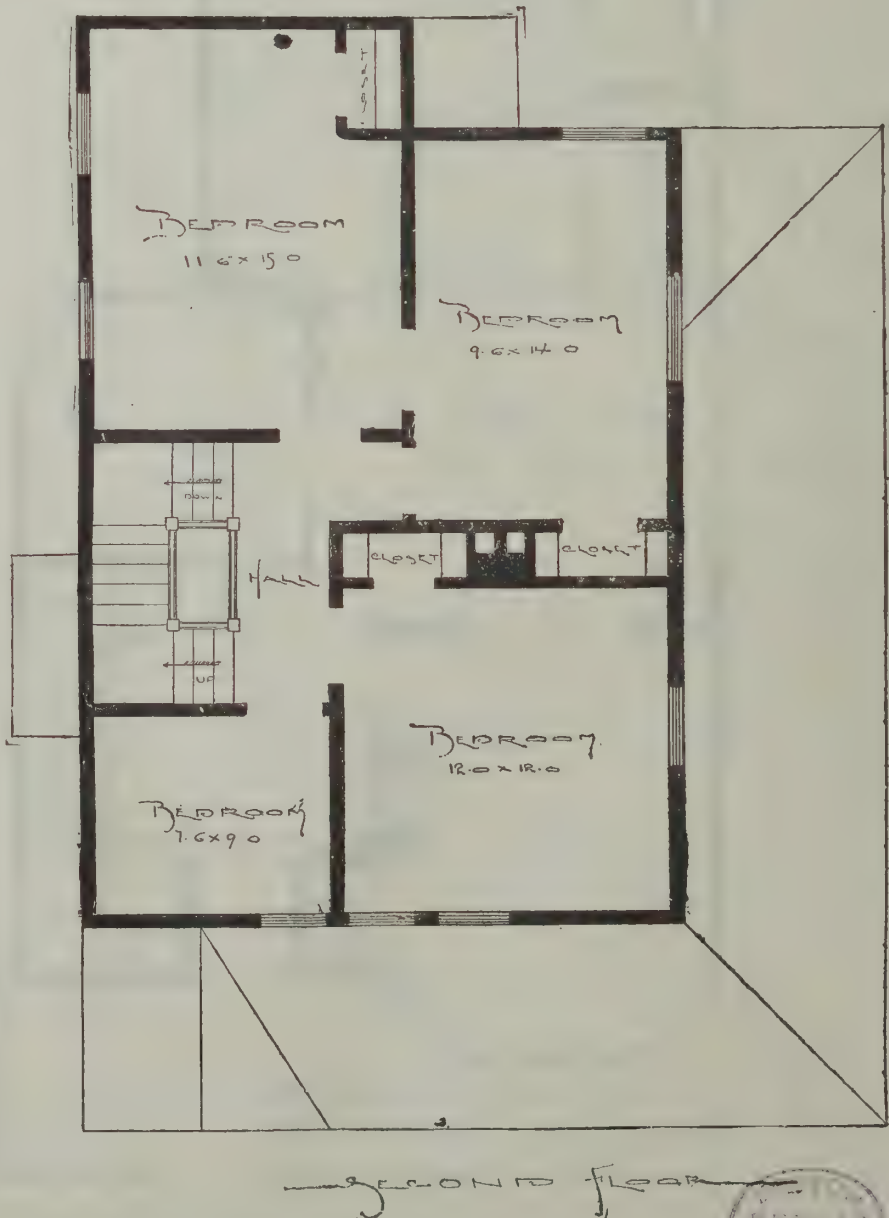
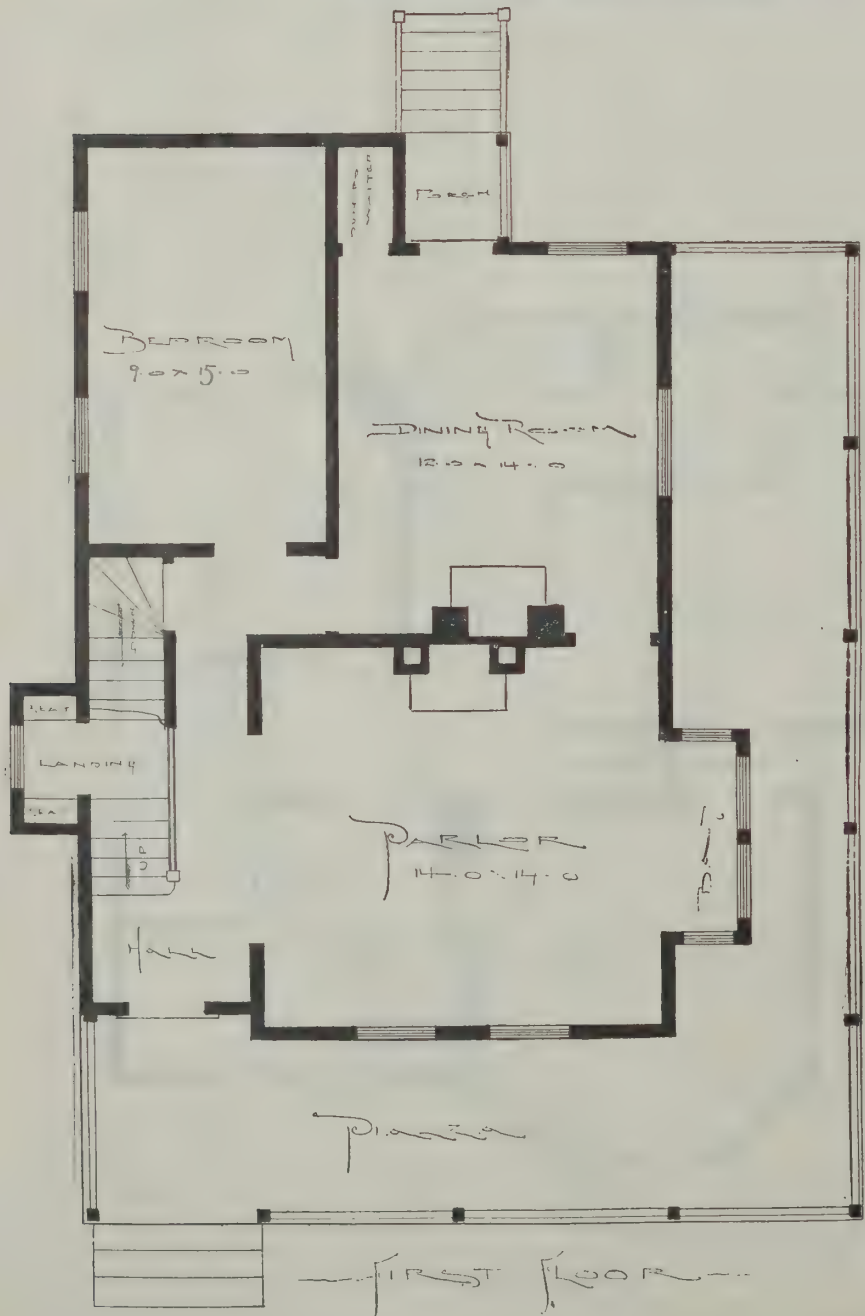
The trim throughout on first floor is of cherry, while the second floor is of white-wood, in its natural color, by having a coat of oil and then a finish in hard oil.

The kitchen is neatly fitted up with range, sink, and wash trays, supplied with hot and cold water.

The pantries are neatly fitted with drawers and shelves, also inclosure is provided for flour barrel.

The kitchen is neatly wainscoted with narrow beaded stuff.

The bath room is neatly fitted up with tub, wash bowl, and water closet, supplied with hot and cold water.



A SEASIDE COTTAGE.



The newels, posts, rail and balusters are cherry, neatly turned, to rear and attic stairs.

All the bedrooms are cheerful and well lighted. They have ample closets, neatly fitted up with wardrobe hooks and shelves.

The house is piped for gas.

The ceilings are all neatly corniced and paneled, and neat artistic flower pieces are provided in the centers.

The cost of this house was \$5,600, complete.

Our perspective was made direct from a photograph of the building specially taken for the SCIENTIFIC AMERICAN.

#### MODERN COTTAGE FOR \$1,800.

This house was lately built on Bangs Avenue, Asbury Park, N. J. It is attractive and conveniently arranged.

There is a cellar under whole of the house, which is cemented, with a foundation of stone and underpinning of brick.

The exterior is covered with beveled white pine clapboarding. The roof is shingled.

On the first floor there is parlor, dining room, and kitchen, hall, lobby, and pantry.

The lobby is a protection against the weather, and contains a pump, and a hat and coat closet. The pantry is fitted up in the usual way, with drawers and shelves.

The kitchen is wainscoted and the sink is neatly cased up as same, with closet under.

In the front hall an easy pair of stairs lead to second floor.

The newel and balusters and rail are neatly turned out of yellow pine.

On the stairs there is a double window, glazed with cathedral glass.

The second floor contains three good sized bedrooms, provided with closet room, linen closet, etc., neatly fitted up.

Ample space in attic, and additional rooms can be finished off if so desired.

The inside trim throughout is of North Carolina pine.

The door and window casings are neatly beaded and turned; sunk angle blocks are at corners, with base blocks at bottom, to finish base board against.

In the parlor there is a very neat wood mantel.

The cost of this house was \$1,800, a very low price for so large a house, with the modern improvements.

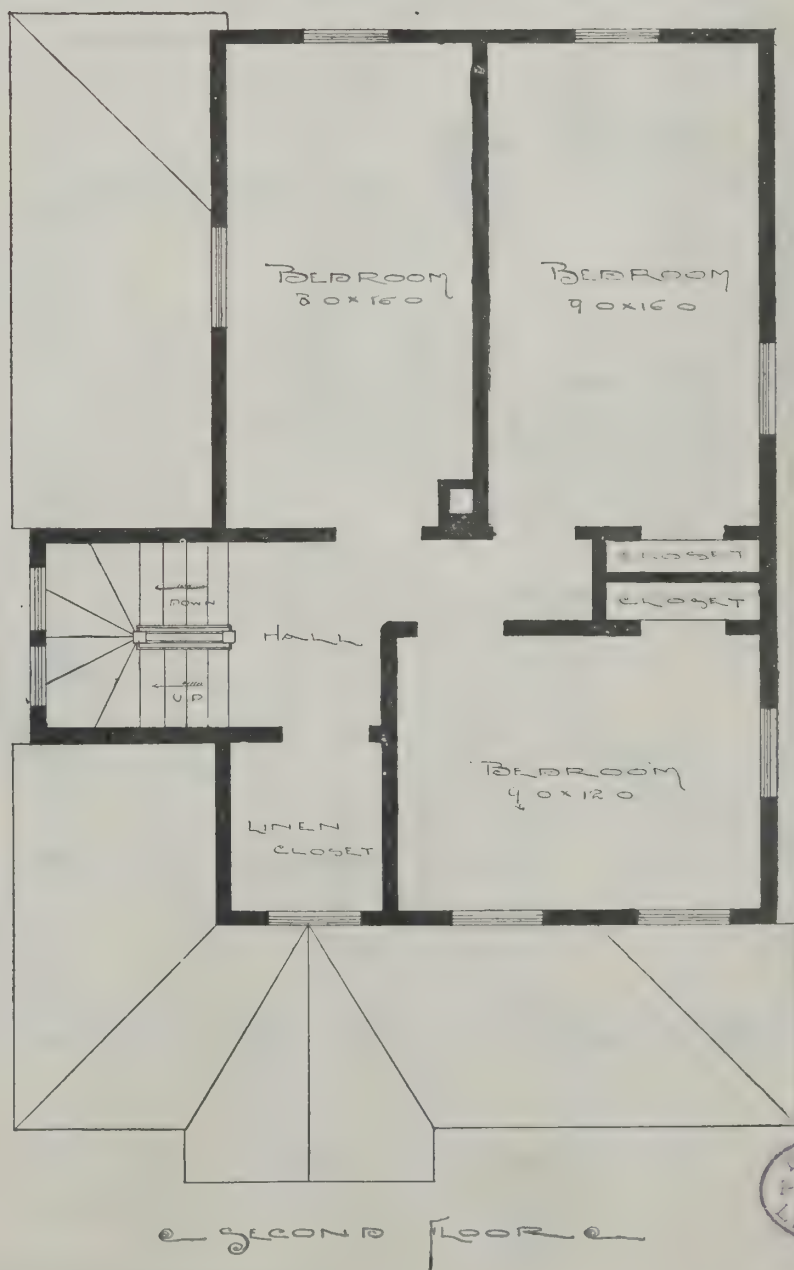
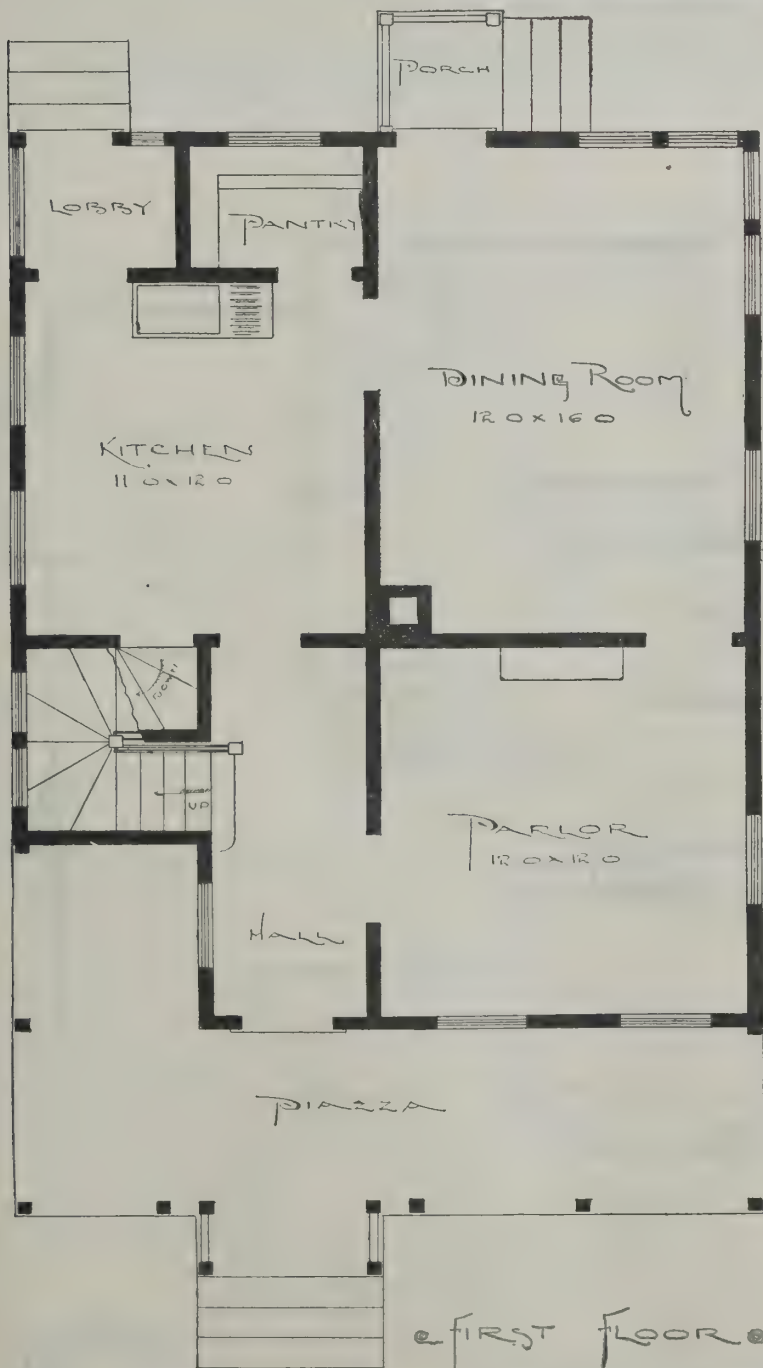
Our elevation was made direct from a photograph of the house taken specially for the SCIENTIFIC AMERICAN.

OUR readers will notice as an interesting feature of this publication that we give a number of plans and elevations of recently constructed dwellings and other buildings. These illustrations are made direct from photographs of the structures, and on this account are

especially valuable; for in no other way can the actual appearance and effect of the various details, appurtenances, and surroundings be so well presented to the mind of the reader. To the builder also these photographic illustrations are of rare utility, as they show him the exact position, form, and appearance of work he will be called upon to execute.

In this connection we beg to remind our readers and, through them, their friends who may contemplate building, that we carry on, in connection with our publication, an effective architectural bureau in which we are assisted by a staff of able and experienced architects. We can supply the full plans, specifications, and details for any of the buildings published in this paper, or indeed any other structures, on moderate terms, with promptitude. Thousands of dwellings and other edifices have been erected from our plans. Our work extends into all parts of the country, and, as a rule, gives entire satisfaction. Our office address is Munn & Co., 361 Broadway, New York.

A MOVING TALE.—In the laying out of Franklin Park a great many houses had, of course, to be removed to make room for improvements, and they were sold to the highest bidder. One of these was secured by a shrewd son of the Emerald Isle, who immediately bought a piece of land in a desirable locality on which to remove his purchase. When the neighbors heard of his plan they became alarmed, and immediately took measures to prevent it from being carried out. They bought the land of him at an advanced price, and he obtained another lot in an equally high-toned neighborhood. Here he was again given something handsome to relinquish his real estate, and it is said that he kept the house on rollers for a year, making money all the time by selling the slightly spotted on which he proposed to put his dilapidated shanty. Unlike poor Joe, this individual became prosperous by "moving on."—*Boston Sat. Evening Gazette.*



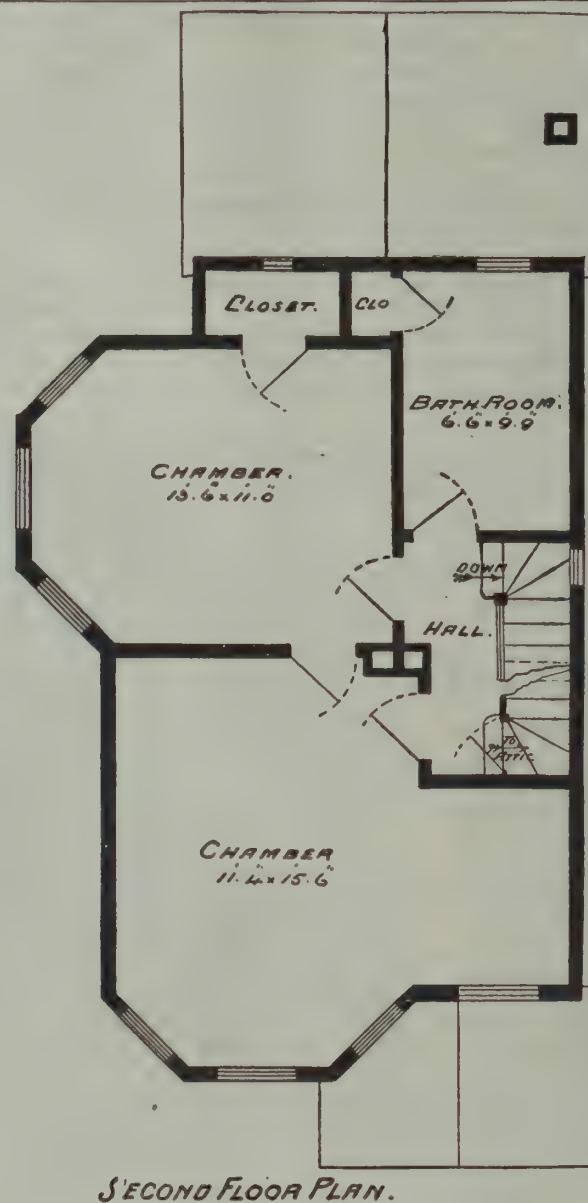
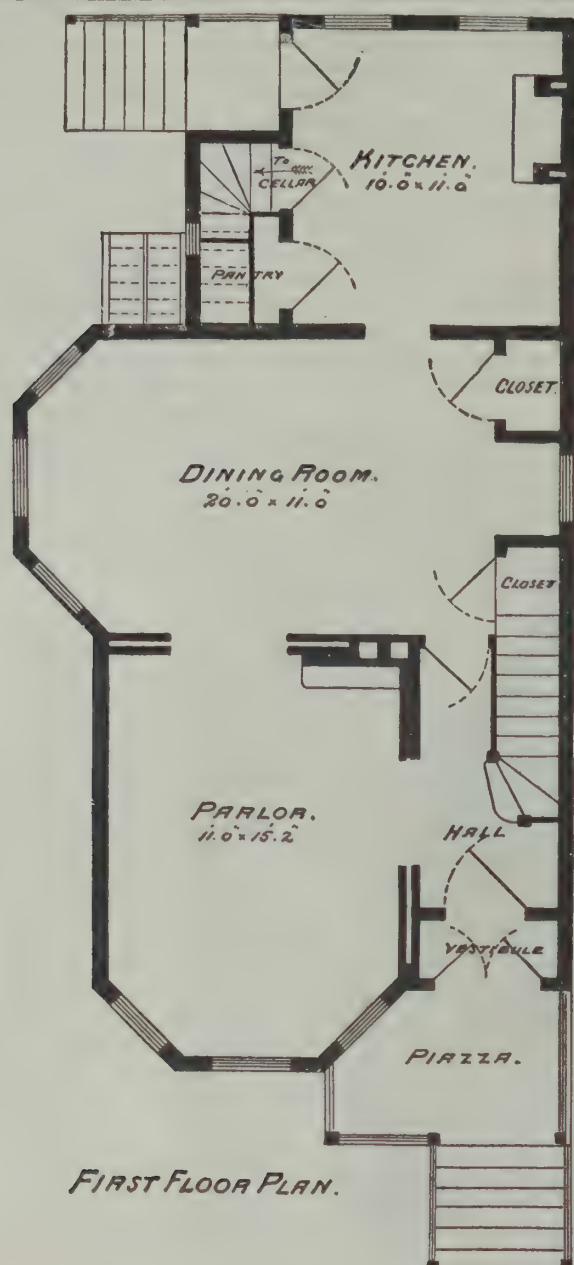
FIRST FLOOR

SECOND FLOOR

MODERN COTTAGE  
COST \$1800

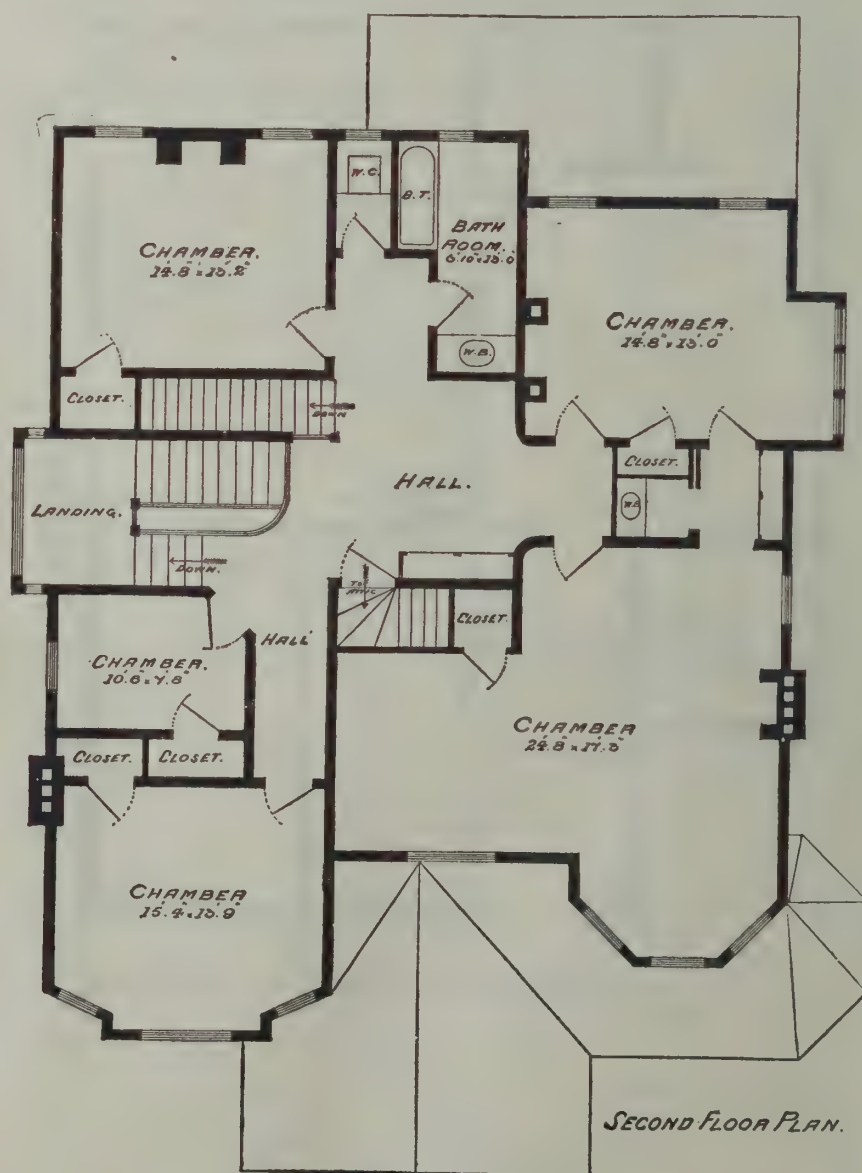
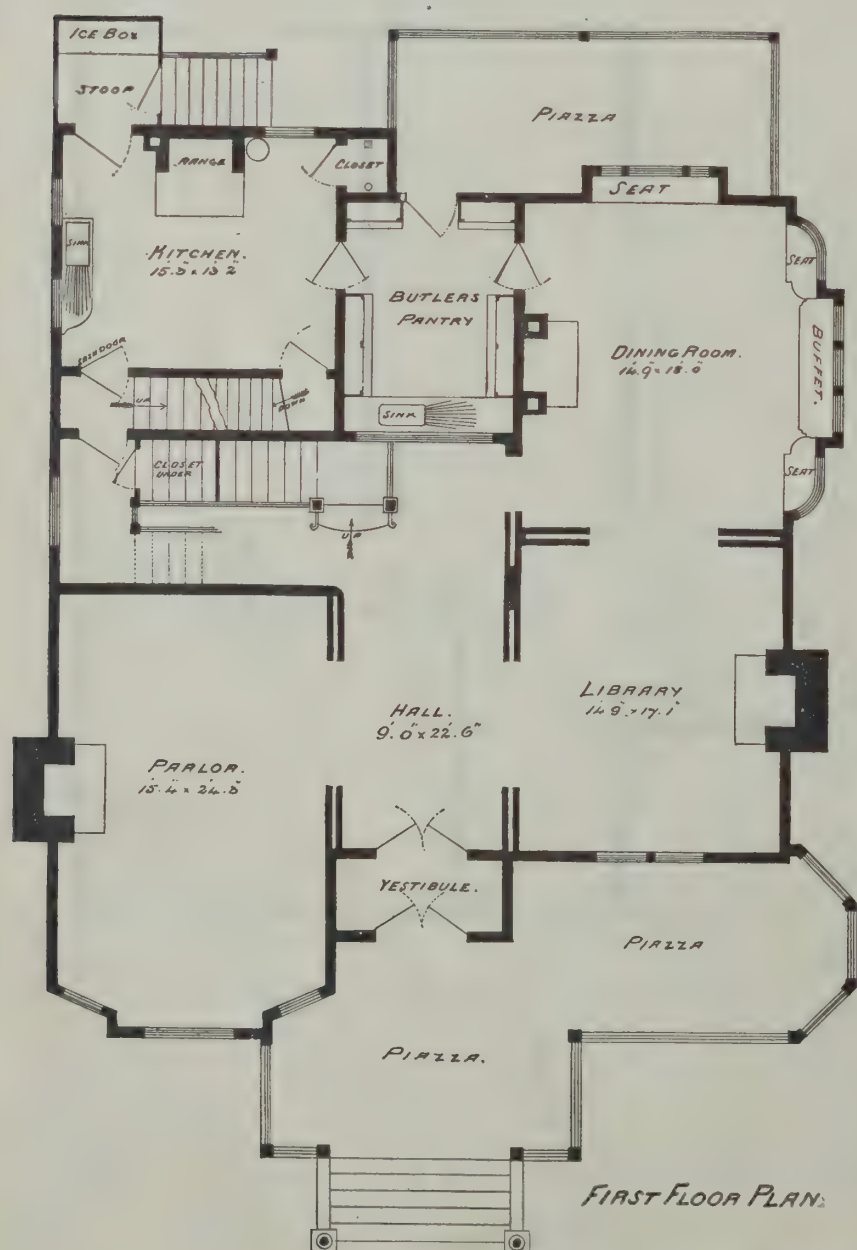






## FLOOR PLANS FOR DWELLING OF MODERATE COST.

[For description see page 46. For elevation see colored plate. For plate of details see page 59.]



### FLOOR PLANS FOR HOUSE ON JERSEY CITY HEIGHTS.

[For description see page 46. For elevation see colored plate. For plate of details see page 60.]





the  
e  
a  
v  
a  
n

cl  
the  
T  
pre  
T  
wh  
han

t  
s  
be  
as  
read  
rem  
cussio  
ment  
New Y  
to dis  
thrown  
vations  
*News*, in  
recalls th  
years ago,  
demic of  
scarlet fev  
Dr. O. W. V



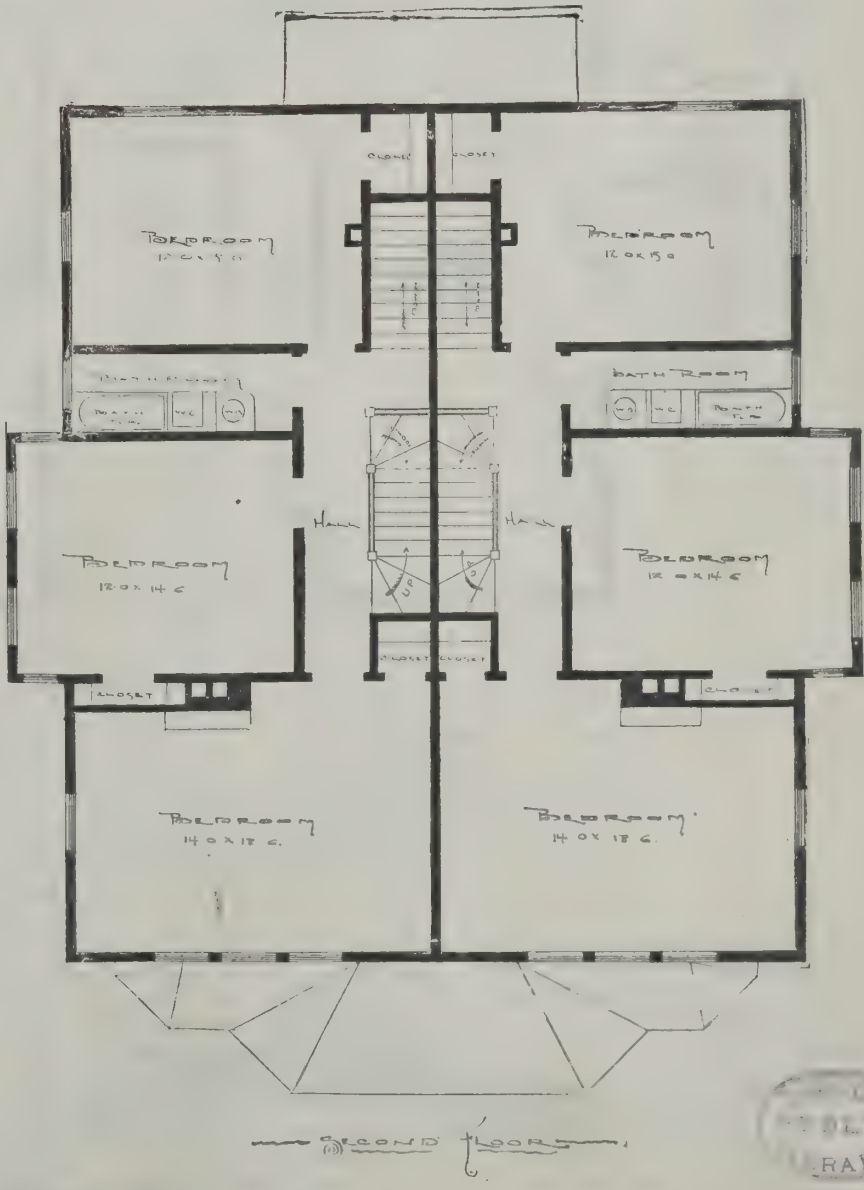
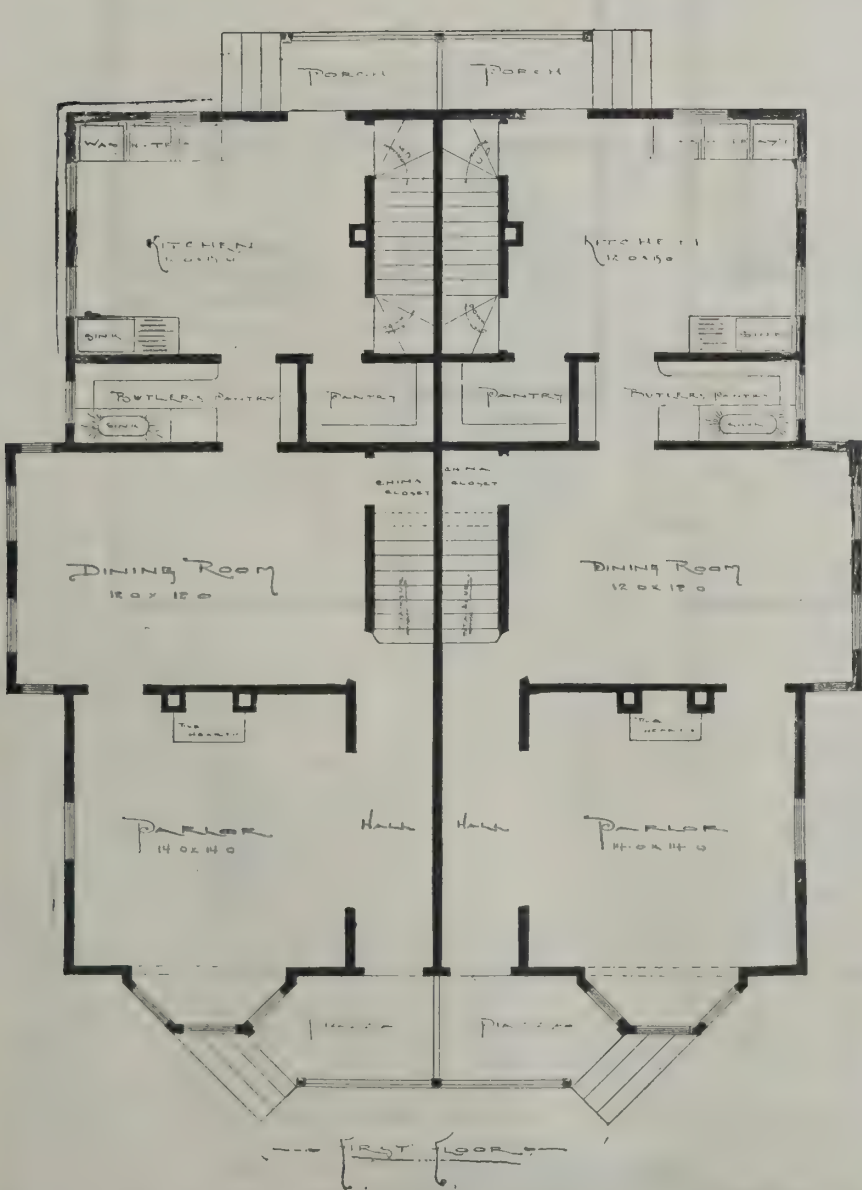
n.  
of  
I  
out,  
ged  
the  
is

arti-  
nese  
s of  
non  
the  
expect  
upon





MRSS. ENG. GONK



A DOUBLE HOUSE FOR \$4,500.  
[For description see page 58.]





**A BASEMENT COTTAGE.**

This house is situated on one of the main avenues at Bath Beach, Long Island, and lately built for Mrs. Connell, at a cost of \$2,300, complete. Our engraving was made direct from a photograph of the building taken specially for the SCIENTIFIC AMERICAN.

There is a basement, which contains dining room, kitchen and store room.

On the first floor there are parlor, sitting room, and bedroom. There are two bay windows, one on side of parlor and another at rear of sitting room.

The kitchen has sink and wash trays neatly cased up and supplied with hot and cold water.

Front and rear entrance to basement.

The piazza extends across the front and on side.

The parlor and sitting room have open fireplaces and very pretty whitewood mantels.

The inside trim throughout is of whitewood, stained cherry, and nicely rubbed down and varnished, giving a beautiful finish.

The door and window casings are tastefully beaded and turned angle blocks are used at corners.

The kitchen is wainscoted with narrow beaded whitewood, and the lower hall is wainscoted similarly. The staircase is of whitewood, stained cherry, with neatly turned newels, posts, rail and balusters.

The walls are corniced and centered.

**A DOUBLE HOUSE FOR \$4,500.**

On Fairfield Avenue, in Bridgeport, Conn., is located a beautiful double house, lately erected, as shown in our photographic engraving.

The house stands in an excellent position, being one of four similar houses fronting on one of the principal avenues.

It contains sixteen rooms, allowing eight rooms on a side to each family.

dining room, or ascend an easy pair of stairs which lead to second and third floors.

The parlor is neatly fitted up, with open fireplace, with a tile hearth and hardwood mantel, paneled in fancy tiles.

From parlor we enter dining room, which is large and airy.

There is a butler's pantry, fitted up with sink and drip, inclosed with narrow beaded North Carolina pine, with doors, with closets under.

The kitchen is wainscoted with North Carolina pine, and has an entrance to cellar and stairs to second floor.

The kitchen is provided with sink and wash trays, supplied with hot and cold water, and neatly cased up same as wainscot. A large pantry, with shelves and drawers, complete.

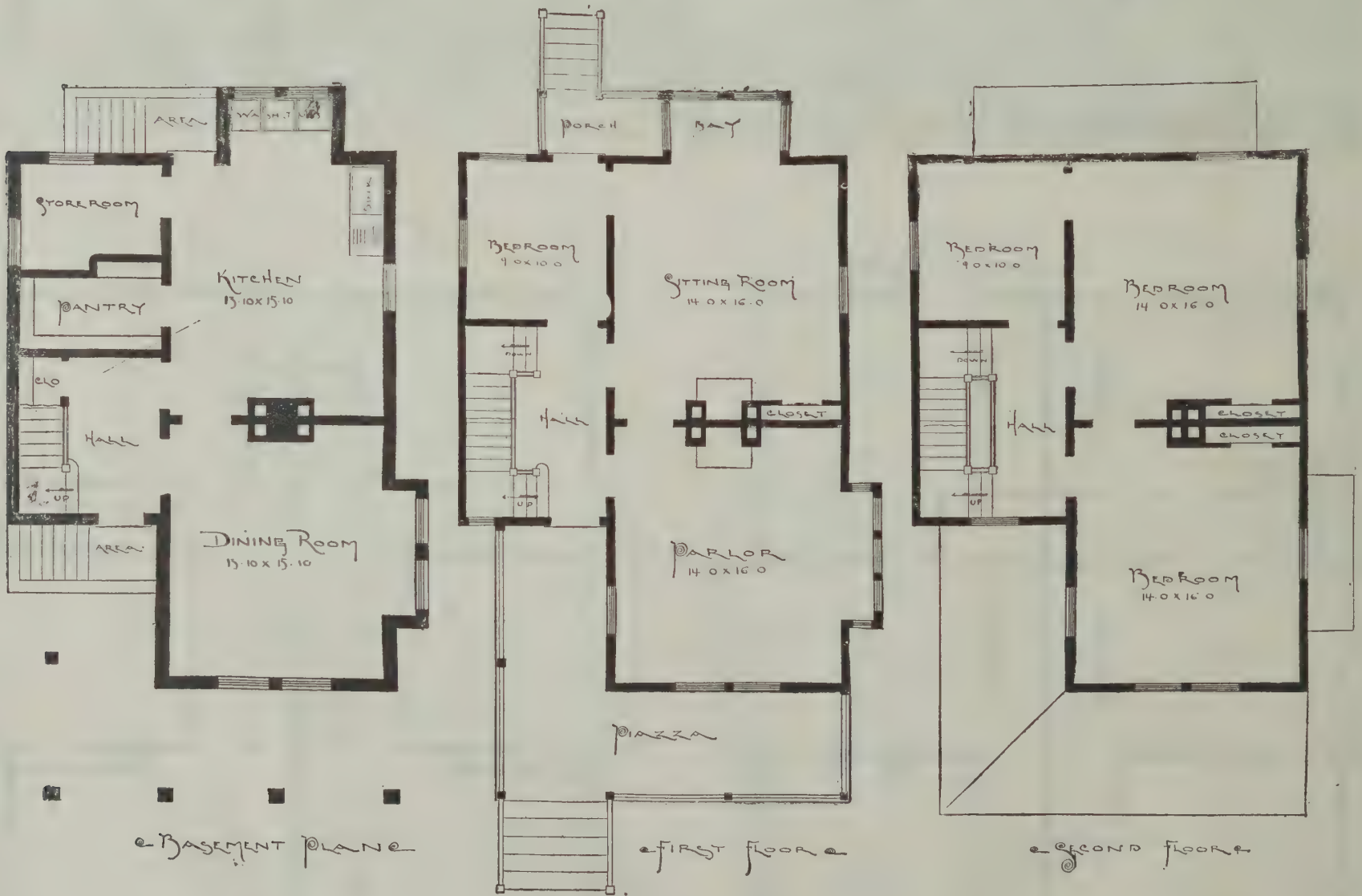
The second floor has three bedrooms, well lighted and ventilated, closets, etc.

The bath room is wainscoted and contains tub, wash bowl and closet, supplied with hot and cold water.

Two rooms finished in attic, provided with closets; ample room for storage, etc.

The inside trim throughout is beaded, and corner blocks are at angles, all of whitewood, finished in the natural wood.

The newels are turned neatly, of whitewood, with balusters and rail the same. Hand rail from first to second floor.

**A BASEMENT COTTAGE.**

If any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, containing full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.

There is a cellar under whole of the house, which is concreted and has an 8" brick partition wall.

The foundation is of stone.

The frame is covered first with sheathing of matched spruce, which is covered with felt paper and then clapboarded.

The gables are covered with cut shingles and finished in a tile red, with little hanging bays in peak.

The porch has turned columns of red cedar, which are finished in the natural wood, and we enter entrance hall, which opens into parlor, by an archway that is provided with curtains, and at the end of hall we enter

The ceilings are corniced and a neat plaster center is provided.

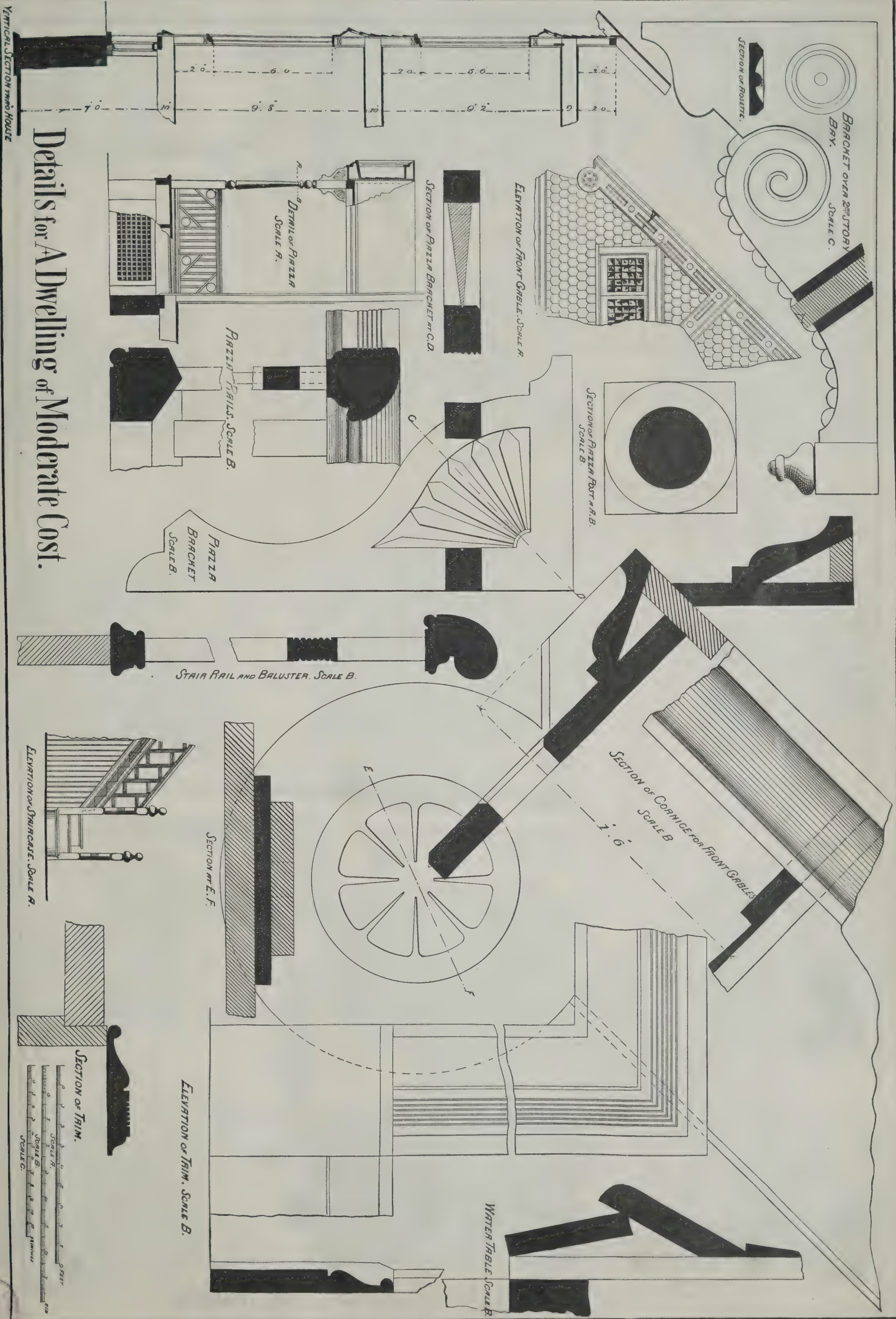
The house is piped for gas and heated by furnace.

This house cost \$4,500 to build, which is a very moderate figure.

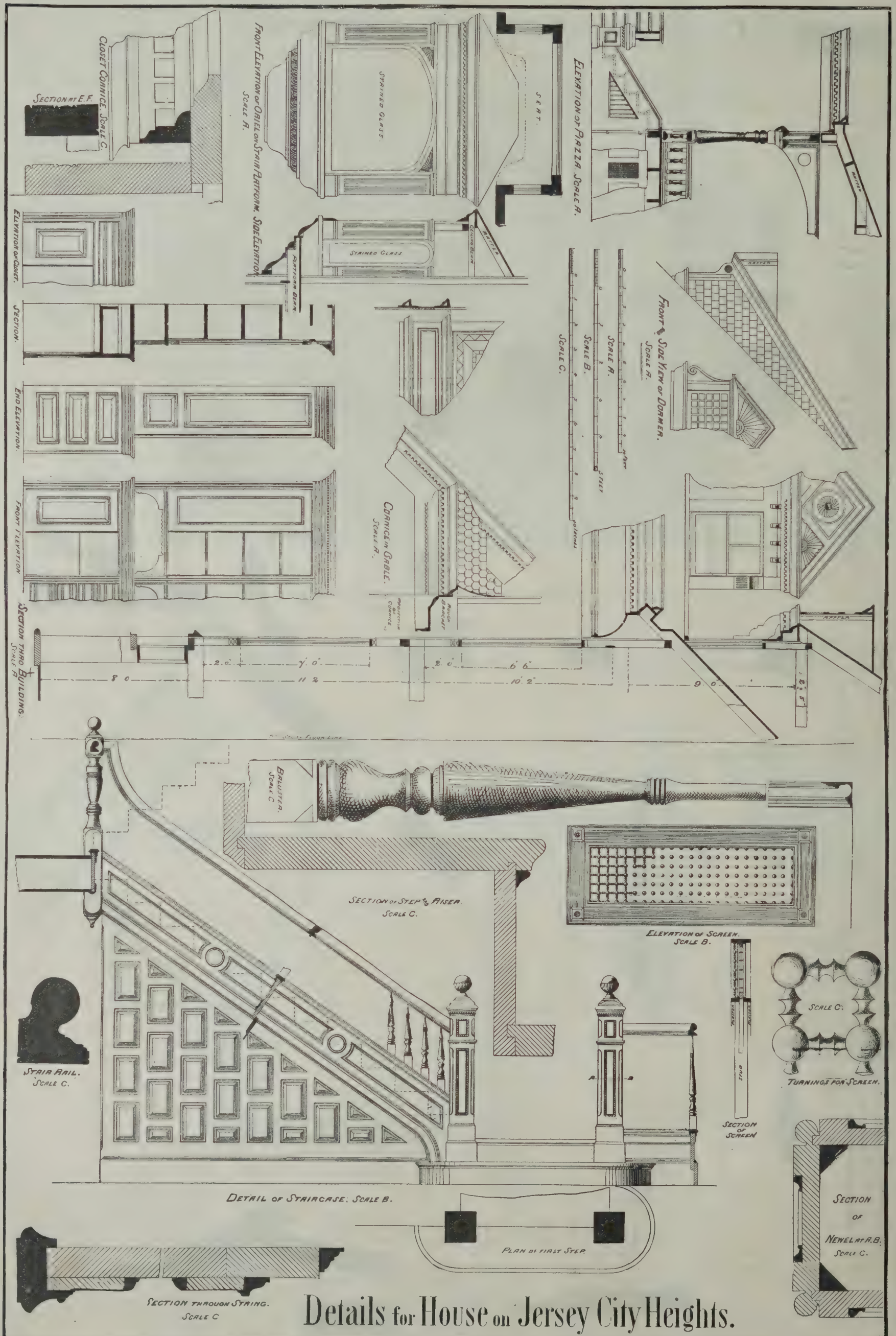
Our engraving was made direct from a photograph of the house taken specially for the SCIENTIFIC AMERICAN.

A STATUE to Shakespeare is to be erected in one of the most conspicuous and fashionable parts of Paris, but it is at the expense of an Englishman.









Details for House on Jersey City Heights.





ELM HOTEL, GREENFIELD, MASS.



RESIDENCE OF A. MESSER, ST. PAUL.



RESIDENCE OF F. H. POWNALL,  
JAMESBURG, N. J.



RESIDENCE OF THOS. J. WALKER,  
HAGERSTOWN, MD.



RESIDENCE OF O. D. BROWN, ST. PAUL.



RESIDENCE OF FRANK W. DRUMMOND,  
BANGOR, ME.



RESIDENCE OF A. F. BEHNKE,  
ST. PAUL.



RESIDENCE OF J. ROSS NICOLS, ST. PAUL.



RESIDENCE OF C. J. HAZARD,  
HIGHTSTOWN, N. J.



RESIDENCE OF J. G. CLARK,  
BANGOR, ME.



SOLDIERS' HOME, BENNINGTON, VT.



RESIDENCE OF DR. J. L. SUYDAM,  
JAMESBURG, N. J.



HOTEL, HAYDEVILLE, MASS.

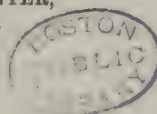


"THE PARSONAGE," HAGERSTOWN, MD.



RESIDENCE OF J. WINTER,  
HAGERSTOWN, MD.

RESIDENCES AND HOTELS.





**A COTTAGE FOR \$2,500.**

Our photographic illustration shows a cottage built on Sherwood Avenue, Bridgeport, Conn., at a cost of \$2,500.

The house contains all the modern improvements and conveniences, the plan is nicely arranged and has a very pretty elevation.

There is a cellar under whole of the house, which is cemented. The foundation is of stone, with under pinning of brick.

The first story is 9' 6" and second story 9'.

The exterior is covered with clapboarding and shingles, giving a pleasing effect.

On the first floor there is a square hall, a parlor, sitting room, dining room, and kitchen; four good-sized bedrooms and bath room on second floor.

The bedrooms are amply provided with closets, fitted up in the usual way.

There is a very nice attic, and additional rooms can be done off if desired.

The kitchen is wainscoted, and contains a sink, provided with hot and cold water, a pantry fitted up with counter shelf, with closets under and shelves.

Back stairs from cellar to attic.

The dining room has two closets, fitted up in the usual way.

The bath room is provided with bath tub, wash bowl, and water closet, all supplied with hot and cold water, and fitted up in the best manner. Wash trays are provided in cellar.



The front stairs are easy and have neatly turned newels, balusters, and rail.

The parlor and sitting room are separated by sliding doors. Neat wood mantel in each.

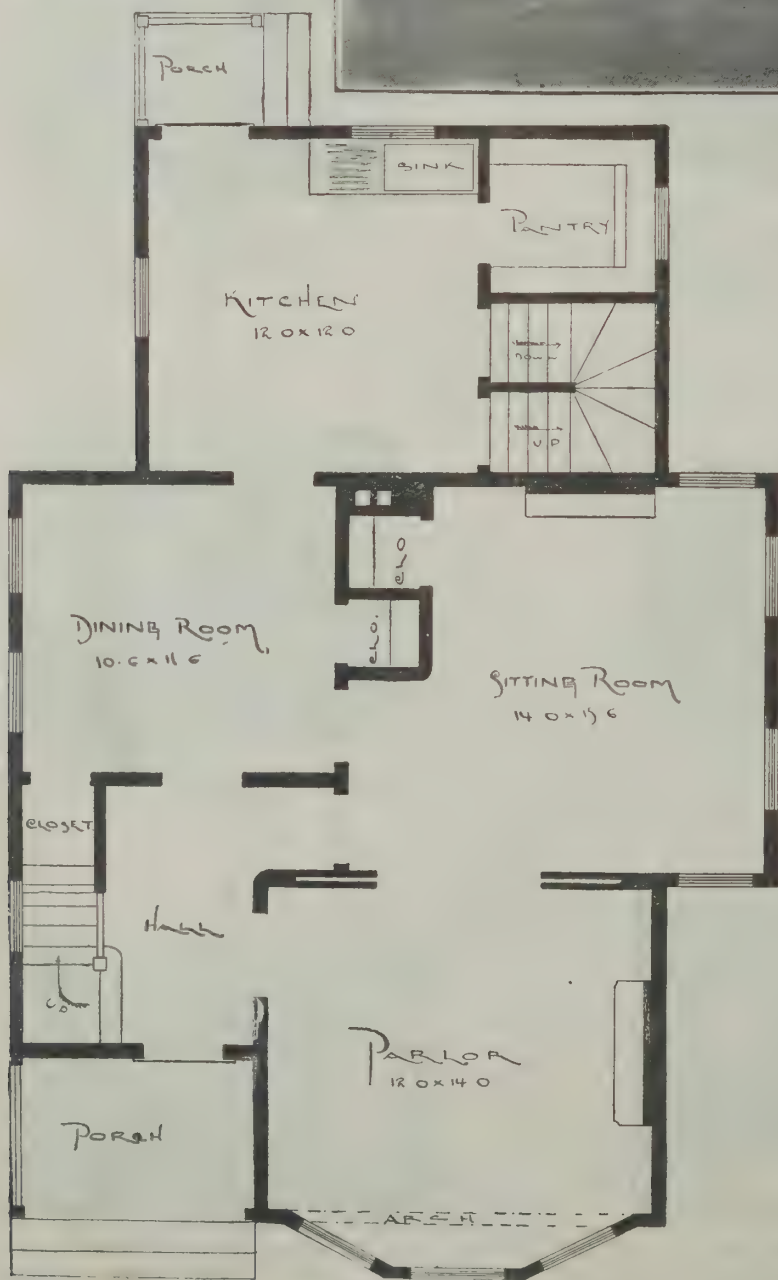
The trim throughout is of white pine, and the door and window casings are hand moulded.

Our engraving was made direct from a photograph of the house, specially taken for the SCIENTIFIC AMERICAN.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

A YOUNG French officer is said to have invented a microphone which will record and announce the approach of a body of soldiers and give some idea as to their numbers.



FIRST FLOOR.



SECOND FLOOR.

A COTTAGE FOR \$2,500.









A House on Jersey City Heights, N. J.





## A Dwelling of Moderate Cost.

Supplement to the Scientific American-Architects and Builders' Edition, September, 1888.







[AMERICAN BUILDER.]

HOW TO BUILD A BARN.

Three years ago I built a new bank barn 50x70 feet, and although it is not larger or more expensive than many others in this part of the country, I think it combines more conveniences for keeping stock and allowing them to be taken care of with less labor than any barn I have seen. Before making my plans I visited several new barns and adopted as many of their arrangements as suited me, and I thought could not be improved. The owners were very friendly, courteous, and entirely willing to answer the question: "If you were going to build again, what alterations would you make, if any?" Some rich gentlemen farmers who have built very costly barns and never do any chores themselves suppose their barns are perfect in every particular, because they cost so much, when the truth is their barns are badly planned, and require double the time to do the chores that it would in one properly arranged. But the practical farmer who takes care of his own stock will tell you: "In building my barn I missed it a little here," or "I made a little mistake there, which I would rectify were I going to build again."

After looking at other people's barns, and studying the barn plans published in the building papers, I draughted the building I proposed to erect. The walls, sills, bents—every stick of timber and every frame, stud, and rafter—were represented on paper before a blow was struck. Every part of the barn, every bay, floor and stall could be seen on the plan. I will begin my description at the foundation, where a building has to be commenced.

With a level it was found how far into the bank it was necessary to dig in order to have the sill on that side about a foot above the surface of the ground. A good deal of the earth was removed very cheaply and expeditiously with a team and scraper, but of course the excavation had to be finished up with a pick, shovel and wheelbarrow. The walls were built chiefly of flat field stones, found in the woods, as the fields had been cleared of stones long before. They were selected for good thickness and a good face. Very thin, shelly, round or ugly-shaped stones were left in the woods for fear the masons would lay them in the wall to get them out of the way, and thus make a poor wall. After the walls were built, these culled stones were drawn and used for filling in between the bank and the walls. A few loads of quarry stones were obtained and roughly dressed for facings and door ways. A trench a foot wide and a foot deep was dug and filled with broken stones where the center of the foundation walls would come, and the bottoms of the walls were commenced with considerable thickness and narrowed up to 20 inches on top. The walls were laid up with strong mortar, made of lime and sand, and have never settled or cracked. The south wall, next the bank, of course, could have no windows. On the east side, where the driveway is, only two windows could be put in, but the upper half of the stable door can be kept open in pleasant weather. On the north end there are three 12-light windows and a door for driving wagons in. On the west side, toward the house, there are three offsets or "jogs" in the wall to keep it only a little above the surface of the ground, and to save masonry and afford a better chance for the six windows and one small door. This is the door we use in going to the

barn to fodder and milk. One great fault of bank barns is that they are seldom sufficiently lighted so that a person can see how to work, even on a sunny day.

The arrangement of the basement will be better understood by an examination of the diagram, Fig. 1. It contains a feeding room nearly in the center, 36 stalls, and 6 calf pens. On the west side are 7 horse stalls, 10 feet long (including mangers), six of them 5 feet wide, and one box stall, 6½ feet wide. The horses' heads are toward the feeding room. Behind the horse stalls is an apeece 13 feet wide and 50 feet long where wagons

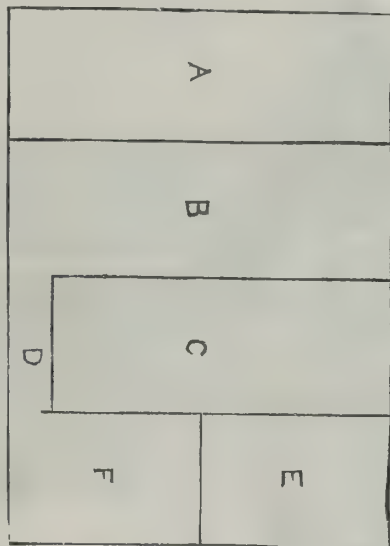


Fig. 2.—FIRST FLOOR.

A, bay, 50x18 ft. B, permanent floor, 50x17 ft. C, grain floor, 44x17 ft. D, covered passage to tool room, 17x6 ft. E, bay, 25x18 ft. F, tool room, 25x18 ft.

can be driven in with feed, roots, or pumpkins, and is a very handy place to drive in and unhitch from a buggy. Visitors' carriages are driven in here. Along the north end are 8 cow stalls, 7½ feet long (including mangers) and 4 feet wide, with cows' heads facing feeding room. The space between the cows and the wall is 3 ft. wide and 4 inches deep, forming the gutter, and giving room for a wheelbarrow to remove the manure. Along the east side are 9 cattle stalls of the same size as the cow stalls, with the same space behind them, with the cattle's heads toward the feed room. The south end has 12 stalls for young cattle, 6 feet long and 3 feet wide, with cattle's heads toward the feeding room and 3 ft. space behind them for wheelbarrow. The gutters are but 4 inches deep, but they should have been 8 inches at least, to insure against cows lying down in the dung, and making them stand forward where they should for milking. Ranged along the passage between the horse stalls and the stalls for young cattle are six calf pens about 5 feet long and 4 feet wide. The feeding room is 46 feet long and 13 feet wide. There we keep our feed, cutting box, measures, forks, etc.

There are four gates leading to the horse and cattle stalls from the feeding room, and if they are kept shut, an animal getting loose cannot trespass in the feed room. There are also gates between the horse stalls and the cow stalls, and between the cow stalls and young cattle stalls. They are very convenient for shutting up cattle for the first time before they become accustomed to their places, and preventing the large cattle from injuring the small ones should they get untied. All the gates have good latches, so that they fasten as soon as they are shut. Hooks and staples are a nuisance and should never be used on anything. At the north end of the feeding room are a hay chute and a straw chute, far enough apart to keep separate the hay and straw thrown from above. At the south end of the feeding room is another chute for throwing down hay or straw. These chutes are not trap doors, but merely openings under the bays, so that the hay or straw is pushed from the floor into the opening and falls to the feed room below. They could be covered by a sliding door, but there is not the least danger of falling down them, and they afford good ventilation for the stables below. Some people may object that the odors from the stables might contaminate the hay and grain, but I have never been able to detect any foul smell on either. The ventilators in the roof allow the vitiated air to escape readily, without its hovering about the mows. It will be observed from the diagram, and the foregoing description, that the hay, straw, and feed, and the person to distribute them, are all on the inside of the circle, with the animals on the outside facing toward the center, so that the feeding can be done with the fewest steps and in the shortest time.

The first floor of the barn, Fig. 2, is divided as follows: Hay bay, at the north end, 18 by 50 feet, and 40 feet high in the peak. This bay will hold over 50 tons. Next toward the south is the permanent floor, 17 by 50 feet with a door for driving in from the east, and a smaller door, for ventilation when thrashing, on the

west side. Farther toward the south is another barn floor 17 by 44 feet—six feet having been partitioned off and made into a covered passage leading to the tool room. This floor is used for grain if needed, after the south bay is filled. The south end is 18 by 50 feet, one-half partitioned off and covered for a tool room and work shop; the other half and the space above the tool room are used as a grain mow, and are first filled by driving in through the left hand door. When the mow at the south end and the space over the tool room are filled, then there is no further use for the left hand or south floor, and that can be filled by driving in at the north or right hand door leading to the permanent floor. If more room should be needed for hay, and less for grain, then some hay could be put into the south bay first, and grain on top of it, and grain on the south or left hand floor. It is obvious that hay on this south floor would be in the way at thrashing time. Over the permanent floor next to the outside doors are two scaffolds 12 by 17 feet, used for grain. They do not occupy space enough to interfere in the least with the operation of the horse fork. The tool room is 18 by 25 feet, and has a driveway, and an outside door for admitting a mowing machine or wagon load of farm tools. It is lighted by three windows, has a work bench, and can be used as a repair shop.

I made the roof steep, because steep roofs are not so apt to leak, and it furnishes more room for hay and grain, and is especially convenient for operating the horse fork, as there are places for hitching the pulley hook to seven different rafters. There is a plank walk for changing the pulley from one of these places to another in order to distribute the hay over the mow, and thus save a good deal of the hard work of mowing away. The change is easily and quickly made, and I prefer this method to a hay carrier. The floors are of oak planks 2 inches thick, jointed and laid on oak joists 3 by 10 inches, and 11 feet and 14 feet long. The joists rest on the side sills and on the three supporting beams under the cross sills. The weather boards are white pine, 1 inch thick and 12 inches wide, planed on the outside and fluted, or hollowed, on the inside to prevent warping. The outside is painted, and the shingles on the roof were dipped in crude petroleum before they were laid. The small doors are swing doors, with strap hinges. The larger doors are hung on rollers, and I would not change them to swing doors, which are very unmanageable in windy weather, and are apt to sag or break the hinges. The chief trouble with roller doors is found when they are made too large and heavy, and, consequently, like a long train of cars, move hard. They should never be wider than 6 feet, and then, with good rollers, they will move easily enough for children to handle, and will last a long time without repairs. There are two doors to allow

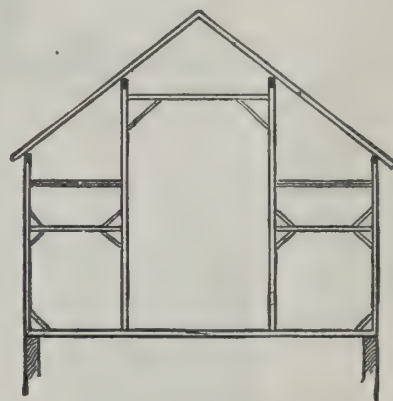


Fig. 3.—TRANSVERSE SECTION.

Plan of third bent from south and between the double floors. From top of scaffold beams or girts, 12 feet. From bottom of sill to top of plates, 20 feet. From bottom of sill to top of purlin plates, 29 feet.

a team to be driven in, one pushing to the right and the other to the left.

STATEMENT OF THE COST.

Excavation for basement.....	\$109 00
Masons and tending.....	130 00
Lime and sand.....	21 00
Drawing stones.....	30 00
Nails, sash and glass .....	26 00
Carpenter's work and raising.....	445 00
32,000 pine shingles at \$4 per M.....	128 00
8,000 ft. white pine weather boards and battens, \$16 per M .....	128 00
1,000 ft. white pine and matched boards for cornices and doors.....	20 00
Dressing lumber .....	25 00
14,000 ft. of timber, board measure, at \$9 per M.....	126 00
11,000 ft. oak joists and floor planks, \$18 .....	198 00
9,000 ft. rafters, roof boards, and braces, \$9 .....	81 00
Lumber for basement floors and stalls..	47 00
Paint and painting.....	73 00

\$1,587 00

Bradford Co., Pa.

J. W. INGHAM.

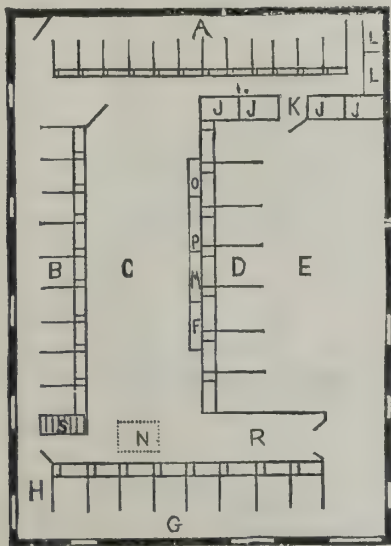


Fig. 1.—BASEMENT.

A, stalls for young cattle, 3x6 ft. including hay box. B, cattle stalls, 4x7½ ft., including hay box. C, feeding room, 13x46 ft. D, horse stalls, 5x10 ft., including hay box. Left hand stall is a box stall 6½x10 ft., with gate. E, open space 13x50 ft., for farm tools, etc. F, cow stalls, 4x7½ ft., including hay box. G, passage 5 ft. wide. H, box for mixing feed. I, meal box. P, bran box. O, oat box. J J, calf pens, two 3x5½ and two 2x5 ft. K, gate, 3 ft. wide. L L, calf pens, 3x6 ft. I, passage, 3 ft. wide. N, hay from chute above. R, passage, 5 ft. wide, in which straw falls through chute. S, stairs, 2½ ft. wide.



## A RESIDENCE AT NANGIS.

For the private dwelling represented in the accompanying engraving the architect had at his disposal but a limited amount of ground, inclosed between two other structures, but he has made good use of it. As the building was intended for a large family, our confrere was obliged, as shown in the ground plan, to give prominence to the parlor and dining room, which form a single room on party occasions. The porch that pre-

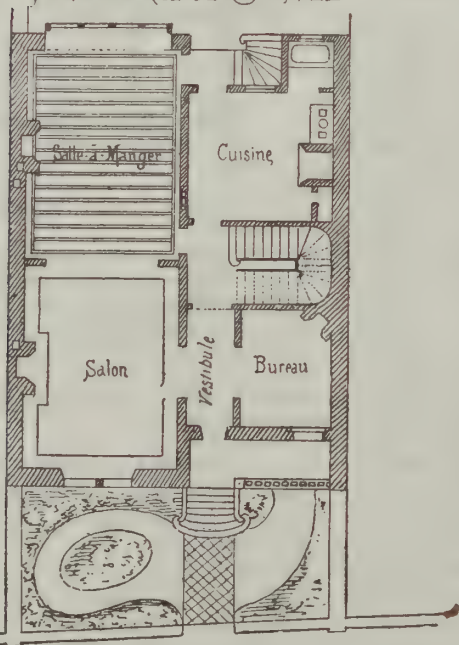
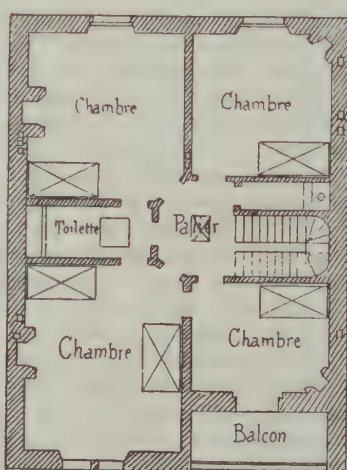
as to form two window piers of monolithic appearance. A filling-in of Montereau faïences surmounts the wooden lintel of the bay windows of the ground floor. The first story is nearly like the ground floor, the arrangement of the bricks only being different; and under the cornice extends a terra cotta frieze, made at the Lombard de Septveilles Provins works. The mullions, sills, and lintels of the bay windows are of old oak, finished with boiled oil. In the part of the front forming a re-

The entire cost was \$8,000.—*La Semaine des Constructeurs*.

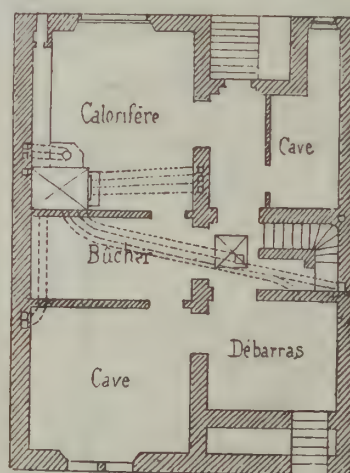
THE *Sanitary News* describes a new plumber's trick, which has been first discovered in Milwaukee, but may be known elsewhere, so that architects and inspectors will do well to be on their guard against it. In Milwaukee, as in many other towns, all soil pipes put



PLAN DU REZ-DE-CHAUSSEE

1<sup>ER</sup> ETAGE

PLAN DU SOUS-SOL



ÉCHELLE DE 0<sup>m</sup>.005 P. 1 MÈTRE (  $\frac{1}{200}$  )

## A RESIDENCE AT NANGIS.

cedes the vestibule, the balcony, and the loggia situated above take up the projecting fore part and give a picturesque effect to the front.

As the structure is designed to be the dwelling of a carpenter, it had likewise to present an ensemble in which should figure all the materials of the country in general and wood in particular. Thus, the base is of dressed burr stone, laid in regular courses and capped with a string course of hard rock. Above, up to the window sills of the ground floor, the front is of red and white bricks, followed by rockwork of natural yellow burr stone laid in mortar of the same color, so

cess the walls are plastered with colored sand mortar in imitation of dressed stone, and are ornamented with panels and artistic wooden lattice work and faïence friezes.

The sides of the gutter and those of the fronton are of terra cotta, with blue and yellow enameled fillets and roses. The roof is of tiles, with designs formed of slate and enameled in yellow and blue tones.

The entire joinery is of oak. The chimney piece of the dining room, as well as the front door, is of carved oak. The large bay window of the dining room is provided with colored glass,

up in dwelling houses must be tested by filling with water. A certain firm, knowing that a defective pipe had been used, contrived to plug it with clay, so that the water applied for testing it did not enter the pipe at all. It is not stated how the inspector happened to find out this ingenious deception, but plumbing inspectors become wonderfully expert in observing suspicious indications, and the offending firm was reported, and punished by having its license revoked until the defective pipe should be replaced by a new one. Most persons will say that the revocation of the license ought to have been made permanent.



Interior Finish.

A New York City lumber firm recently addressed a letter to a large number of master car builders, asking the four following questions, and the answers form such an interesting summary that we reprint them from the *Railroad Gazette*:

- (1) What wood or woods are you using for the interior finish of your coaches?
- (2) If more than one, which would you prefer, supposing cost to be the same?
- (3) Which of all woods (including mahogany) would you prefer, supposing cost were to be the same?
- (4) Will you kindly give your reasons for this preference?

The answers to the questions may be summarized as follows:

WOOD USED FOR INSIDE FINISH.

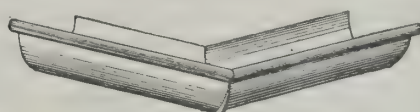
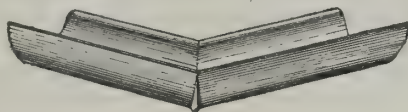
Oak and gum	1
Mahogany	5
Cherry and oak	1
Quartered oak	1
Solid mahogany, first class coaches	1
Solid ash or oak, second class coaches	
Solid white ash, emigrant coaches	2
Oak, ash and mahogany	
Mahogany and prima vera	1
Cherry and mahogany	2
Ash, white walnut, quartered oak	1
Mahogany and black walnut	
Oak	1
Mexican mahogany, not too dark	1
Georgia pine stained, second class coaches	1
Walnut, ash, cherry and mahogany	1-21

The following woods would be preferred if cost were the same:

Mahogany	16
Oak	2
Ash	1
Oak and walnut	1
Quartered oak for day cars	1
Mahogany with baywood mouldings, cherry doors and ash and finish below belt for sleepers special cars	

Reasons for the preference of mahogany:

- Improves in appearance with age.
- Can be scraped and varnished without looking shabby.
- Resists effects of atmospheric changes, moisture, dry-



PATENT ANGLES OR MITERS, FOR EAVE TROUGH CORNERS.

ness, heat and cold, which warp, check, and open the joints of other woods.

- Beauty.
- Durability.
- Free from sap and acids, which in other woods are objectionable to painter and cabinet maker.
- Does not warp or twist.
- Shade medium, and therefore pleasing to the eye.
- "Greatly respected by all classes of passengers, and consequently does not receive the abuse from them that a coarser appearing wood would."
- Public prefer it.
- Richest finish.
- More susceptible to a superior and high quality of ornamentation.
- Easily worked.
- Easily finished.
- Susceptible of the highest polish.
- Most easily cleaned.
- Stands best in all conditions of service.
- Less shrinkage than oak and consequently preferable in spite of darker color.
- Reasons for preferring oak:
- Stands bad usage better.
- Can be refinished.
- Light color more cheerful for passengers.
- Strongest.
- Most easily finished.
- The objections to other woods:
- All woods, except mahogany, deteriorate with age.
- Cherry stained to imitate mahogany looks well at first, but soon becomes shabby and cannot be effectively renovated.
- Oak and ash are coarse grained, and if finished smooth, the grain becomes filled with dirt, making the car look gray.
- Maple looks cheap and tame.
- Black walnut is gloomy, especially when old.

Roof Slates.

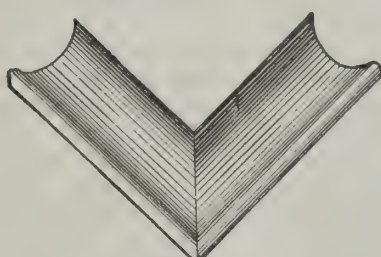
The samples of the slate to be tested should be carefully weighed, and then put into boiling water for a quarter of an hour. The water must, however, be fairly free from lime, saltpeter, and ammonia. The slates are then reweighed, and those that show the greatest increase in weight are those most capable of resisting deterioration.

H. W. Johns' Liquid Paints.

The neatly gotten up case of samples, showing the various paints prepared by the H. W. Johns Manufacturing Co., of New York, should be in the hands of every dealer in paints and every one who has occasion to use paints for a variety of work. These samples are not only suggestive of the most appropriate coverings to be used in work that one has determined must be done, but really seem to invite by their attractive appearance as much new work as possible. Many of the new samples of roof and railway paints are particularly pleasing to the eye, while these paints possess an elastic body and are very economical. They are especially adapted for painting tin and other roofs, railroad buildings, bridges, and other iron and rough wood work. The company also make an iron-oxide paint, which is ground very fine, mixes readily with raw or boiled oil, and is superior in color to any metallic paint in the market.

SEAMLESS EAVES TROUGHS WITH MITERED CORNERS.

The accompanying illustrations represent the new patent angles or miters for eaves trough corners, made by machinery, by Messrs Hatten, Galpin & Co., of Binghamton, N. Y., and also their eight foot seamless eaves trough, made half round, in sizes from four to ten inches. These goods are made in all the better grades of tin, in galvanized iron, and in copper. These troughs last longer than short lengths, and are straighter, stiffer, and stronger, saving labor and improving the looks of the building. The angles or miters for corners have a patent rib pressed in one piece at the miter



tinctly seen, it is unobjectionable; but when the leaf supports the volute at the angles of the abacus, it is on the very verge of good taste. With their disregard of precedent and untrammelled wildness of imagination, the Gothic architects tried every form of vegetable ornament, from the purest conventionalism, where the vegetable form can hardly be recognized, to the most literal imitation of nature. By employing the former an architect can never sin against good taste, though he may miss many beauties; with the latter class of ornament he is always in danger of offense, and few have ever employed it without falling into mistakes. In the first place, because it is impossible to imitate perfectly foliage and flowers in stone; and secondly, because if the plant forms of plants are made to support, or do the work of, hard stone, the incongruity is immediately apparent, and the more perfect the imitation the greater the mistake. In too many instances, even in the best Gothic architecture, the construction is so overlaid by imitative vegetable forms as to be concealed, and the work is apparently done by leaves or twigs, but in the earliest and purest style this is almost never the case. As a general rule, it may be asserted the best lithic ornaments are those which approach nearest to the grace and pliancy of plants, and the best vegetable forms are those which most resemble the regularity and symmetry of those which are purely conventional.—J. Ferguson.

A Model Boston Kitchen.

It is possible, nowadays, by spending money lavishly, so to build a kitchen that the most ingenious of servants cannot keep it otherwise than clean. One need not waste upon her unappreciative soul the costly tiles with which one lines the bath room, but may substitute for them the glazed bricks which are as highly polished, and which will make the floor, the chimney, the walls, if desired, and even the ceiling, as easy to clean as a breakfast plate. Once built, no white-washer and no painter would be needed for such a room, no smoke need cling to its walls for an instant, and no odor of cooking would be perceptible in it, even if it were used for generations. And the temperature of such a room need not reach the great height una-

joint to stiffen and strengthen them, making them superior to the best hand-made angle. They are made with either inside or outside bead, in all ordinary sizes. Tanners are invited to order a sample lot.

The Oscillations of High Chimneys.

In the *Memoires de la Societe des Ingenieurs Civils* some particulars are given of the oscillations of a chimney stack near Marseilles, 36 meters (115 feet) high, with an exterior diameter at the top of 1.52 meter (4 feet). During a severe storm it was determined, by observing the shadow of the chimney, that its greatest oscillation was half a meter (nearly 1 foot 8 inches). It was further observed that a chimney set in motion by a gust of wind oscillates from four to five times backward and forward until it is at rest again. M. E. Burg asserts that, should the momentum during the oscillations of a chimney repeat itself in such a manner that its direction coincides with that of the oscillation, the overthrow of the chimney may be expected. This is the explanation given for the destruction of many a chimney constructed in accordance with sound principles of stability. *Oesterreichische Zeitschrift fur Berg und Huttenwesen* adds to this statement the qualification that in the case of a chimney near Vienna, 50 meters (164 feet) high, and constructed of concentric (hollow) rings, with an inner diameter at the top of 2 meters (6½ feet), which is exposed to considerable gusts of wind, the oscillations were most carefully and repeatedly measured with a theodolite, when the observations showed an extreme oscillation of only 16 centimeters (6½ inches) during severe storms.

Imitative and Conventional Ornament.

In certain styles of art vegetable forms are employed. Among these perhaps the most beautiful and perfect ever invented was that known as honeysuckle ornament, which the Greeks borrowed from the Assyrians, but made so peculiarly their own. It has all the conventional character of a purely lithic with all the grace of a vegetable form, and as used with the Ionic order is more nearly perfect than any other known. The Romans made a step further toward a more direct imitation of nature in their employment of the acanthus leaf. As applied to a capital, or where the constructive form of the bell beneath it is still dis-

voidable with plastered walls, which permit the warmth of the chimney to be perceptible through their surface, and thus both the good health and the good temper of the cook would be maintained. As for coloring, such a kitchen may be precisely what one pleases, for the bricks are made in all hues, and they may be laid in patterns or in wide surfaces of one tint from floor to ceiling. Lastly, as such a room would be fire proof, a sliding or swinging iron door would so isolate it that no kerosene-quicken fire and no careless upsetting of lard could bring destruction on the whole house, or do any injury to the room itself of which a little water would not clear it.—*Boston Beacon*.

Weeds.

At this season of the year the principal and most important operation in the garden is the destruction of weeds. Labor and money will be saved if all surfaces of exposed soil are stirred so frequently that the germinating seeds of weeds are killed before the plants appear above ground. It is hard to realize this always, or to command labor enough in a large garden to make it always practicable, still it is the only economical way in which to deal with weeds. In the case of Purslane, for example, if the plants are allowed to grow large enough to make any appearance above ground, they have to be hoed or pulled up and then raked into piles and carried away and burned or buried deep, or they will root again after the first shower, and the work will have to be done over again. The Purslane, the Shepherd's Purse, the Chickweed, and some other weeds, flower and ripen their seed in a surprisingly short time after they appear, and if the gardener allows them to get any start of him his land will soon get full of their seeds, which will live for a long time under ground and germinate as soon as cultivation brings them near enough to the surface. Theoretically, there never should be a weed of any kind in a garden, but in this climate of hot suns and frequent rains there will always be more or less of them. They should not be fed, however, to pigs, as is often done, as the seeds then get into the manure pile and so increase the work of succeeding years. In large gardens vegetables should, wherever possible, be planted in rows, so that labor may be saved in cultivating them and in destroying the weeds by the use of horse power.—*Garden and Forest*.



## ARTISTIC FURNITURE.

We show herewith cuts of hall seat and frame which the well known house of Keeler & Co., 81 to 91



HALL SEAT AND FRAME.

Washington St., Boston, have made in oak, for one of their customers at Bar Harbor.

Messrs. Keeler & Co. manufacture to order a great variety of fine furniture at their factory in Cambridge, Mass., many of the designs being especially attractive, and would be pleased to give estimates to any who may desire them.

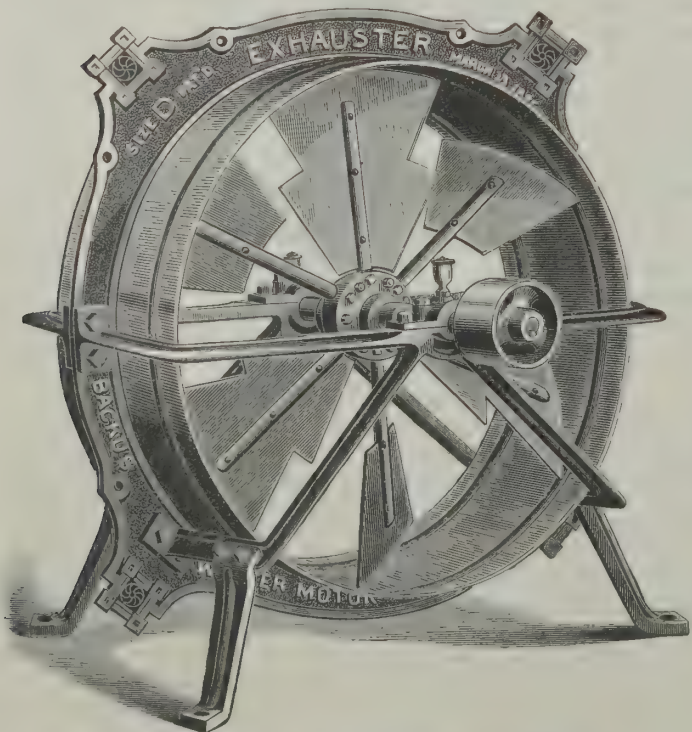
## Corrugated Metal Building Material.

The Cincinnati (O.) Corrugating Co. has just issued a new catalogue of its productions, consisting principally

of corrugated iron roofing, siding, ceiling, arches, lath, shutters, doors, etc., and standing seam plain roofing, V-cripped roofing, standing seam corrugated roofing, beaded ceiling, roll and cap roofing, iron weather boards, and other sheet metal building material. The company has rarely less than 1,000 tons of goods in stock, and has maintained a high standard of manufacture both in material and workmanship.

## IMPROVED VENTILATING FANS.

A large proportion of our principal hotels, public buildings, and factories are now supplied with ventilating or exhaust fans, and although their general introduction is of comparatively recent date, their use has come to be considered almost a matter of necessity, especially during the summer months. They are also



THE BACKUS IMPROVED VENTILATING OR EXHAUST FAN.

employed for removing foul air from kitchens and hotel basements, for cooling engine rooms, japanning shops and foundries, for removing steam from rooms where hands are at work, for drying malt, wool, tobacco, leather, and a thousand similar purposes, in which they have been found to facilitate the work in industrial occupations, as well as promote the comfort of the employees.

The accompanying illustration represents the latest improvements in exhaust or ventilating fans, as made by the Backus Water Motor Co., of Newark, N. J.—a company which has directed much effort to solving the problem of how to move and handle large volumes of air with the least outlay. The fan is designed in every part to give the greatest strength, and the blades are of peculiar form, especially designed to prevent back lash. The arms are of wrought iron, and have no jam nuts or set screws to break or become loose, while the band and blades are of heavy sheet steel. The wheel is reversible, and can be used for throwing air into a room or exhausting it therefrom, as may be desired. The frame is so constructed that it can be bolted to the wall or partition in which the fan is set up, the feet being easily removed, or the fan may be set up on a shelf. It can also be driven horizontally or perpendicularly.

The Backus Water Motor Co., having had a large experience as experts in matters of ventilation, would be pleased to furnish plans and specifications for such work when desired, and they claim to be able to perform far better work with their new exhaust fan than can be accomplished by any other means. Those desiring further information on ventilating fans, etc., are requested to write the Backus Water Motor Co., as above.

## Bent Glass for Circular Fronts and Towers.

The incongruity of constructing a building with a circular front or tower, or bay window, and using flat glass, instead of glass bent to shape, is so noticeable, that its frequent occurrence can only be accounted for on the supposition that many architects and builders do not know how easily, and at what a slight extra expense, properly bent glass, either plate or sheet, can be obtained. Messrs. Vanhorne, Griffen & Co., of New York City, are large manufacturers of bent and beveled glass, at their factory in Newark, N. J., where they bend plate glass in sheets as large as 60 x 120 inches, the extra cost for bending average sizes being 50 cents per foot for plate glass and 20 cents per foot for sheet. They are always able to promptly furnish any size and style of glass desired.

## Stains for Coloring and Tinting Mortar.

Buildings in the construction of which various colored stones are used afford fine opportunity for the architect and builder to obtain pleasing effects by the use of stained or tinted mortar and cement. For this purpose, as well as in pressed brick construction, stains of red, brown, buff, and black are now much used. The coloring matter employed should be unaffected by the atmospheric changes, and have no influence on the strength or durability of the mortar, containing neither oil, gas, nor salts, the latter being apt to increase the white deposit common to brick fronts. Colors ground in paste form are said to be the most practical, as they mix easily and give uniformity of color, and among these the goods known as the "Pecora mortar stains," made by S. Bowen's Sons, of Philadelphia, have a high reputation. Their stains have been in use for a good many years, are economical, and are warranted not to fade or run. They are sold by the largest and best dealers in building supplies in most of the leading cities.

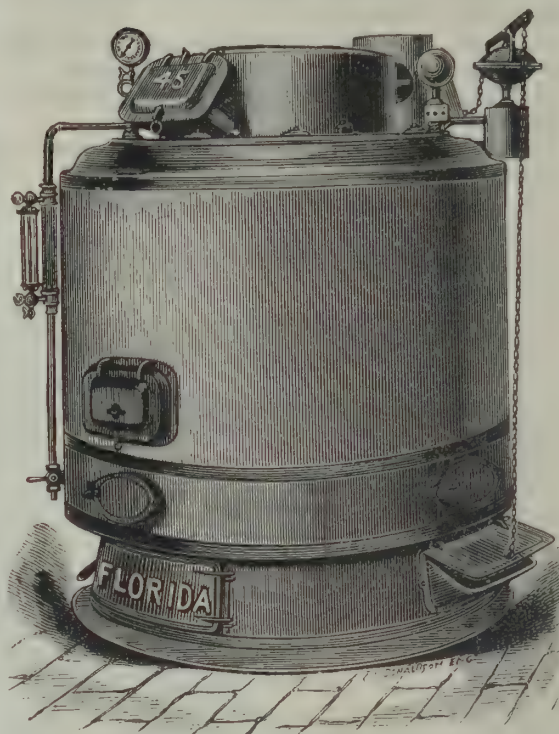
## Roof Painting.

The best modern roof is frequently made of tin or iron, and if well painted and properly cared for, will last for forty years, but too often the painting is not properly done, the roof begins to rust, then to leak, and a new one is necessary at a large cost. To protect a metal roof from rusting is an easy thing to do if the architect will insist upon having it painted with Prince's Metallic Paint. If bought ground in oil in paste form, it is frequently grossly adulterated, and its value decreases; but by using the dry paint and mixing it with pure linseed oil (7 lb. to 1 gal.) a paint is produced that has no equal for durability and preservative qualities. It costs no more used in this way than if bought in oil, and there is a satisfactory certainty about it that is gratifying to every house owner. About once in two or four years a coat of this paint should be applied and well brushed out, as a thin coat well put on is far better than a thick coat, and will last longer. The same article when used for coloring mortar is very desirable, as a uniform shade is produced, but a small quantity being required, it being very strong in

coloring matter, one pound being equal to 5 lb. of Spanish brown.

## THE FLORIDA STEAM AND HOT WATER HEATERS.

In most of the first class residences and buildings built at the present time, there is no system of heating considered by either architect or owner except steam or hot water, and the "Florida" heater has be-



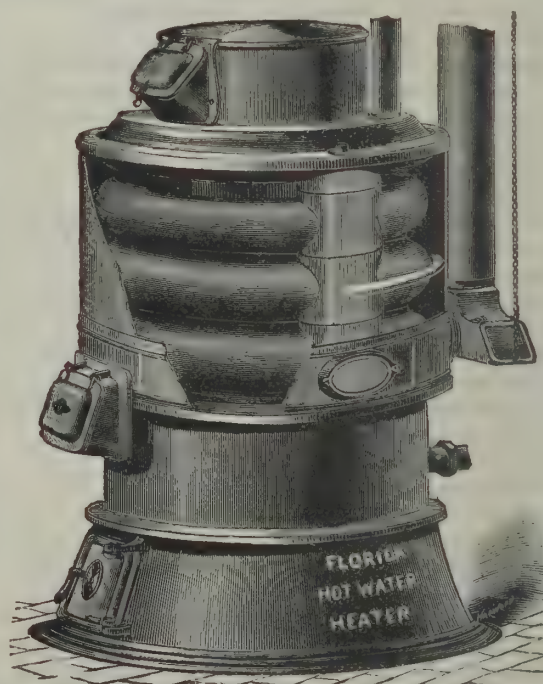
FLORIDA STEAM HEATER.

come very popular for heating small and medium sized buildings of every class and character.

They are thoroughly well made, of best materials for such uses, and manufactured by an old and trustworthy concern, who guarantee fully every "Florida" heater made and sold by them. Duplicate parts may be obtainable years hence, if ever required, as the manufacture of the "Florida" heater is an established interest, in which it is said that nearly one million dollars capital is required to properly handle the enterprise.

The "Florida" heater works are located at Geneva, Ontario Co., N. Y., at junction of New York Central, Lehigh Valley, and Fall Brook Railroads, leading east, west, north, and south, and cover a floor area of over 100,000 square feet.

In heating apparatus there are the same varieties as in every other line of manufactured goods, and the "Florida" offers, with its tested merits, an established reputation, reliability and responsibility, and great convenience and economy in daily use.



FLORIDA HOT WATER HEATER.

The sole manufacturer of the "Florida" heaters is the Pierce, Butler & Pierce Manufacturing Co., Syracuse, N. Y.

## A Venerable Larch.

At West Lavant House there is a very old larch, conspicuous, not for its great height, but for its spread of branches and girth of stem. The stem at a foot from the ground girths 15 feet, while great arms, thick as ordinary larch stems, have grown outward and come down to the ground. The tree is still as healthy as in the prime of youth, for it must be a very aged tree, and there is nothing in the soil to stimulate the rapid formation of bulk of stem, for the subsoil is chalk.



# F. W. DEVOE & CO.

(Established 1852)

## PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made only of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS.**

ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.

Catalogues of our different departments to responsible parties.

Cor. Fulton and William Sts.,  
NEW YORK.

Coffin, Devoe & Co.,  
176 Randolph St.,  
CHICAGO.

## DEXTER BROTHERS' ENGLISH SHINGLE STAINS



Are made of the very best English Ground Colors, and contain no benzine, water, or creosote. They have been thoroughly tested by some of the best Architects in the country during the past three or four years, and the colors are more lasting than any other stain. The price is 75 cents a gallon for any color. We would advise Architects to specify Dexter Brothers' English Shingle Stain, and note the number on the Sample boards. Send for Sample Boards of Colors. DEXTER BROTHERS, 55 and 57 Broad Street, Boston, Mass.

Send for copy of Memoranda of Specifications.

## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

MURPHY & COMPANY,  
227 BROADWAY,  
New York City.

## THE ECONOMY COMBINATION

Steam and Warm Air Heater

—AND THE—

Economy Warm Air Furnaces

ARE PERFECTLY ADAPTED TO

Warming Churches, Schools, Residences, &c

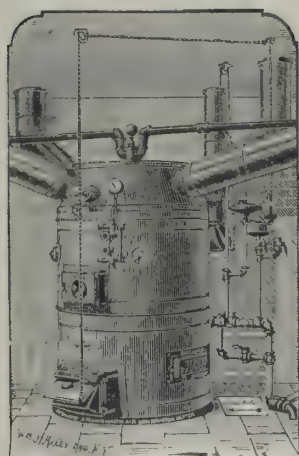
THEY ARE GUARANTEED DURABLE AND ECONOMICAL.

Send for our Catalogue, giving full particulars, descriptions, and illustrations of 31 different styles and sizes of Heating Apparatus.

MANUFACTURED SOLELY BY THE

**J. F. PEASE FURNACE CO.**

SYRACUSE, N. Y., AND TORONTO, ONT.



The Combination Heater.

Eastern Agents.—EARL B. CHACE & Co., 206 Water St., New York; JOHN DEMAREST, General New England Agent, 75 Union St., Boston; W. H. FENNER & Co., Providence.

Western Agents.—ADKINS & HOFFMAN, 177 East Randolph St., Chicago, Ill.; GOSS HEATING AND PLUMBING CO., 703 Main St., Kansas City, Mo.; ARTHUR A. PONT, 35 Washington Ave. South, Minneapolis, Minn.; GAGE & HORTON MFG. CO., 1231 Olive St., St. Louis, Mo.

## GLASS.

VANHORNE, GRIFFIN & CO.  
131 to 137 Franklin Street,  
New York,

—Importers of—

French Window & Picture Glass

POLISHED AND ROUGH

PLATE GLASS

Ornamental Glass.

French and German Mirrors.

Manufacturers of

Bent and Beveled Glass.

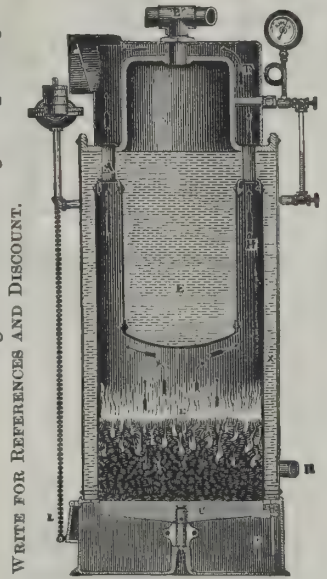
BENT GLASS WORKS,

NEWARK, N. J.

## Duplex Steam-Heater Co.

Manufacturers under FISKE'S PATENTS,  
10 Barclay Street, New York.

Simplest in Construction.  
Largest Steaming Capacity.



Send for Illustrated Catalogue and Price-List.  
AGENTS WANTED EVERYWHERE.

## Architects, Builders, and House Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call

Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken,

leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

GENERAL OFFICES:

No. 708 PENN AVENUE, PITTSBURGH, PA.

Branch Offices:

Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
139 East Madison Street, Chicago. F. E. Dehenhardt, Manager.

MANUFACTURERS OF

The **WARING ANTI-INDUCTION** and **BUNCHED CABLES**, and **ACHESON COMPOUND CABLE.**

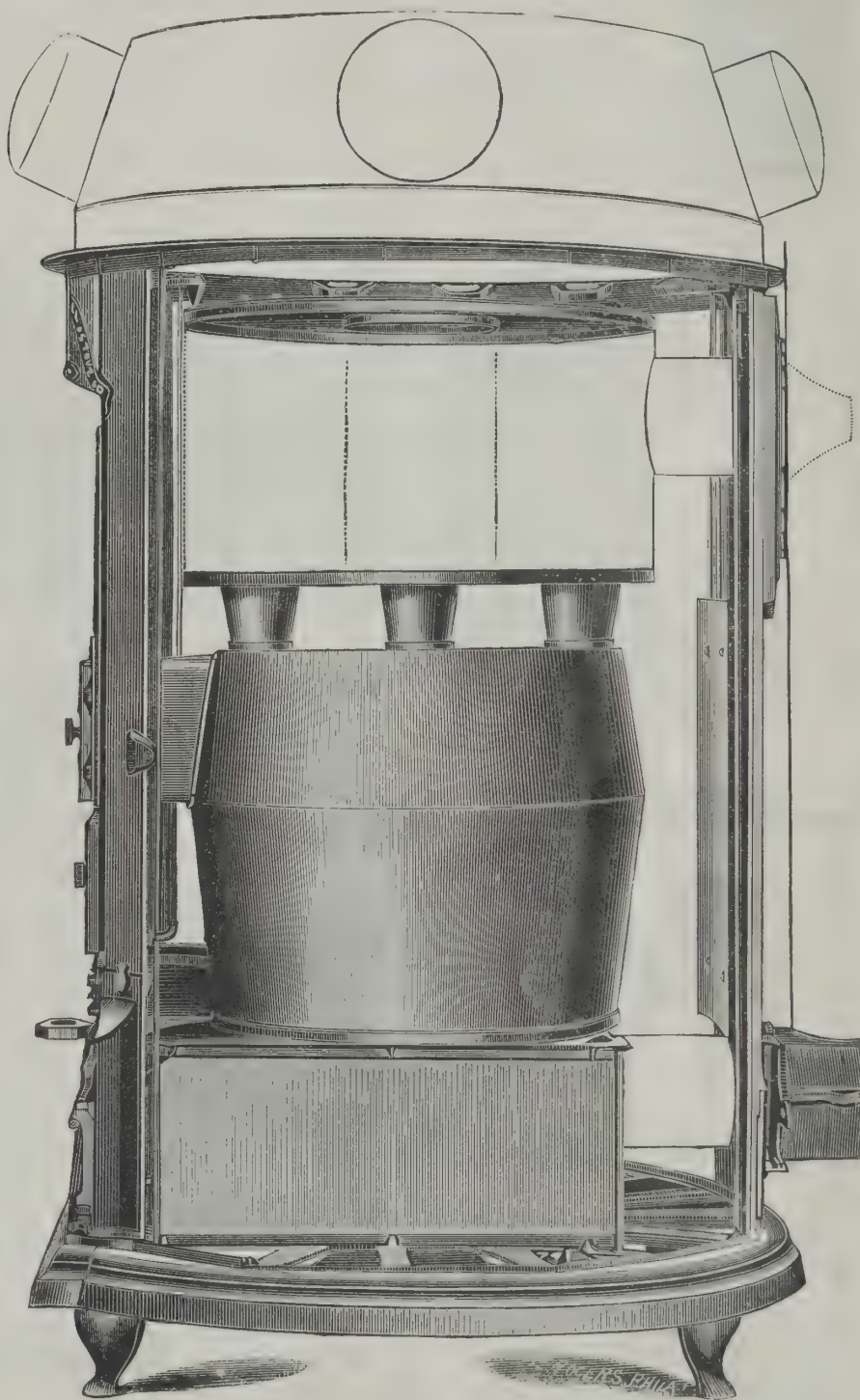
For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial.

**Light Leaded Cables** (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.

**Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.**

All Work Guaranteed.

Send for Illustrated Circular.



Solar Iron Clad.

This is a Cast Iron Casing, lined with tin or galvanized iron, to prevent direct radiation of heat in cellar; four loose panels lift out, so as to give access to furnace for repairs or renewal, if necessary, without disturbing the Hot Air Pipes; it has sliding panels for feed door and smoke pipe to allow for expansion; it has also a dust flue and flue door for Damper. We claim this to be the most complete, durable, and convenient cold case made, equal in efficiency to Brick set, with much less room required and less expensive, besides the facility for access for repairs, without requiring, as in a brick set, so large a space to work in. It is much superior to the ordinary sheet iron casing, both for durability and efficiency. It is not necessary to remove the casing or Hot Air Pipe to clean out, or repair, or even renew or change the heater.

## The Leibrandt & McDowell Stove Co.,

PHILADELPHIA and BALTIMORE.



**MORSE ELEVATOR WORKS**

**MORSE, WILLIAMS & CO.**  
Successors to OLEM & MORSE, Builders of all kinds of  
**PASSENGER AND FREIGHT**

**Elevators.**  
Automatic Hatch Doors  
A SPECIALTY.  
Send for Illustrated Circular.  
Office, 411 CHERRY ST.  
Works, Frankford Av., Wilsey  
and Shaokamaxon Sts.,  
PHILADELPHIA.  
N.Y. Office, 108 Liberty Street.

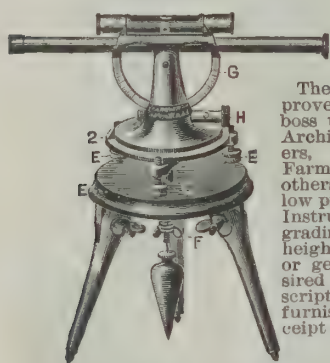


Telephone Call,  
360 Pearl.

**HENRY H. HILL**

36 Pearl Street,  
NEW YORK,  
MANUFACTURER OF  
**ELEVATORS**  
FOR—  
Factories, Stores, Warehouses,  
Stables, etc., operated by  
Steam, Hydraulic, Bel, and  
Hand Power.  
Shafting, Hangers, Pulleys,  
etc.

**M. B. SWEEZEY,**  
MANUFACTURER OF  
**Improved Dumb Waiters**  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
CHICAGO, ILL.  
120 Twentieth Street,



**JOHN W. HARMON,**  
65 Haverhill Street, Boston, Mass.

The latest improved, i. e., the  
boss to Engineers,  
Architects, Builders,  
Contractors, Farmers,  
and all others requiring a  
low price Leveling  
Instrument for  
grading, measuring  
heights, squaring,  
or getting any de-  
sired angle. De-  
scriptive circulars  
furnished on re-  
ceipt of stamp.

**The GREAT LIGHT**

FRINK'S Patent Reflectors, for Gas  
or Oil, give the most powerful, softest,  
cheapest and best light known for  
Churches, Stores, Show Windows, Banks,  
Theatres, Depots, etc. New and elegant  
designs. Send size of room. Get cir-  
cular and estimate. A liberal discount  
to churches and the trade. Don't be de-  
ceived by cheap imitations.  
I. P. FRINK, 551 Pearl St., N. Y.

**CHARTER'S GAS ENGINE.**

2 to 25 H. P.  
The Simplest, most Reliable, and  
Economical Gas Engine  
in existence.  
An impulse at every revolution.  
Perfect steadiness guaranteed for  
Arc or Incandescent Electric  
Lights.  
Independent of gas works when  
desired, and makes its own  
gas at a cost of 65 cents per  
hour to each indicated H. P.  
A Perfectly Safe Motor  
for All Places and Purposes.  
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.  
**Williams & Orton Mfg. Co.**  
P. O. Box 148. **STERLING, ILL.**

SEAMLESS  
COPPER TUBES,  
SHEET BRASS DRAGWIRE  
SEND FOR CATALOGUE  
175/177 LAKE ST.  
CHICAGO.

Mention this paper.

"ZERO TO 27° BELOW AND THE HEATER GIVES THE BEST OF SATISFACTION."

Letter from E. T. FORD, Esq., Hanover, N. H., in reference to

**GURNEY HOT WATER HEATER.**

HANOVER, N. H., Jan. 5, 1888.

GENTLEMEN:—We have had some good  
weather lately to try the heater. The  
weather has been from zero to 27° below,  
and the heater gives the best of satisfaction  
to all concerned. The coldest day we had  
it gave them all the heat they wanted  
with the water at 180°.

Yours, E. T. FORD.

Illustrated Catalogue and Testimonial Sheet Free.

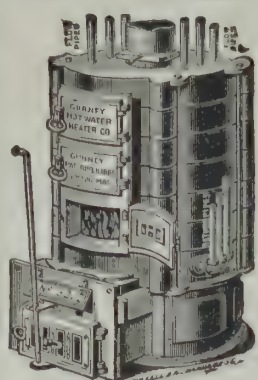
**Gurney Hot Water Heater Co.**

No. 237 Franklin St., Boston, Mass.

Selling Agencies:

New York, M. H. Johnson, 140 Centre St.  
Detroit, T. R. Chase, 31 Edmund Place.  
Portland, Or., W. Gardner & Co., 134 3d St.  
Chicago, Rice & Whitacre Mfg. Co., 42 & 44 W. Monroe St.  
Charleston, S. C., Valk & Murdock, 16, 18 & 20 Hasell St.  
Covington, Ky., J. L. Frisbie, 526 Philadelphia St.

MENTION THIS PAPER.

**CONTRACTORS AND BUILDERS.**

We can make it to your advantage to correspond with us  
before placing orders for Plain and Corrugated Iron and  
Steel Roofing, also Siding, Ceiling, Arches, Lath, etc. Our  
specialties are exclusive and our goods will give the best of  
satisfaction to your customers. Estimates promptly furnished.

THE CINCINNATI CORRUGATING CO.,

150 Eggleston Ave.,

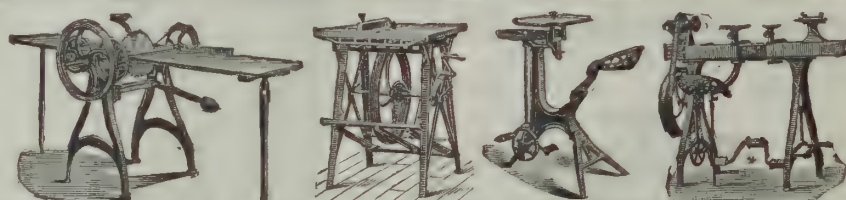
Cincinnati, Ohio.

**HENRY S. NORTHROP.**

Corner Centre & Franklin St. New York, N.Y.

**PANELED SHEET IRON CEILING**

FIRE PROOF, ORNAMENTAL, DURABLE, QUICKLY PUT UP  
SUITABLE FOR ALL CLASSES OF BUILDINGS.  
CAP SEAM AND CRIMPED IRON ROOFINGS.

**FOOT-POWER MACHINERY.**

COMPLETE OUTFITS FOR CONTRACTORS AND BUILDERS.

Machines for ripping, cross-cutting, scroll-sawing, mortising and  
tenoning, forming edges, grooving, gaining, rabbeting, cutting  
dados, and turning. Builders use our Hand Circular Rip Saw for  
the greater portion of their ripping in preference to carting their  
lumber to a mill five minutes' drive from their shops. The same  
is true in regard to scroll sawing, mortising, tenoning, cutting stuff  
for drawers boxes, etc. Builders using these machines can bid  
lower and save more money from their contracts than by any  
other means.

**Read the Following Letters from Builders:**

CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your  
Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the  
ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped  
as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs  
and sawed all drips for 200 windows."  
ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers  
to make for a drug store; the steam power mill wanted 50 cents each for making them.  
With my foot power machinery I made them, and saved \$25 above good wages on the job.  
If desired, these machines will be sold ON TRIAL.  
The purchaser can have ample time to test them in his own shop and on the work  
he wishes them to do. Descriptive Catalogue and Price List Free.  
W. F. & JOHN BARNES CO., No. 567 --- Ruby St., Rockford, Ill.

**CHAS. E. LITTLE, 59 FULTON ST.**

New York.

Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for

**W. F. & J. Barnes' Workshop MACHINERY.**

New York Agency.

Factory Prices.

**Patent Foot Power Machinery!**

The Latest and Most Improved.

Scroll Saws, Circular Saws,  
Lathes, Mortisers, Etc.

**THE "ACME" CIRCULAR SAW.**

For Foot or Hand Power.

Suitable for various kinds of work, in  
Cutting-off, Ripping, Mitring, Rabbeting,  
and Grooving, and with the addition of the  
extra attachments, Scroll Sawing, Boring,  
etc.  
Price, with two 7-inch Saws, \$40.

**"Diamond" Mortising Machine.**

Will mortise 1/4 to 1 inch wide, 3 inches  
deep, and with the addition of the Diamond  
Adjustable Tenoning Tool,  
cut Tenons 1/8 to 3/4 in. thick,  
3 in. wide.

Price, with 3 chisels,  
\$25.

Machines on Trial.  
Catalogue Free.

**Seneca Falls Mfg. Co.,** 276 Water Street,  
SENECA FALLS, N. Y.



MANUFACTURED BY

**CUSHMAN BROS. & CO.,**

BOSTON, MASS.

All Shades and Upholstery Goods at  
Bottom Prices.

**AUGER BITS.**

Square, Oval, Round,  
Smooth Boring, for fine  
carpenter, cabinet, and  
pattern work. 1/2 in. bit  
50c.; set of five, 4 to 8-  
in. \$4.00, free with list,  
by mail, receipt of  
price. BRIDGEPORT  
GUN IMPLEMENT  
CO., 17 Maiden Lane,  
New York.

**E. & H. T. ANTHONY & CO.,**  
591 Broadway, N. Y.

Manufacturers and Importers of

**PHOTOGRAPHIC  
INSTRUMENTS,**  
Apparatus and Supplies,

OF EVERY DESCRIPTION.

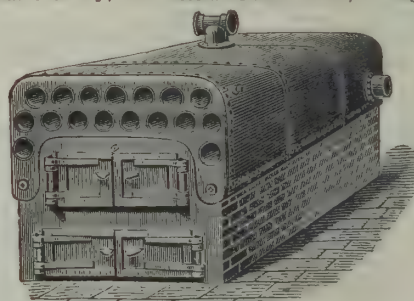
Sole Proprietors of the Patent  
Detective, Fairy, Novel, and  
Bicycle Cameras, and the Cele-  
brated Stanley Dry Plates.  
Amateur Outfits in great varie-  
ty from \$5.00 upward. Send for  
Catalogue or call and examine.

More than Forty Years Estab-  
lished in this line of business.

**DEVINE'S STEAM BOILER WORKS,**  
Marine, Locomotive, Tubular, House, and  
**GREENHOUSE BOILERS.**

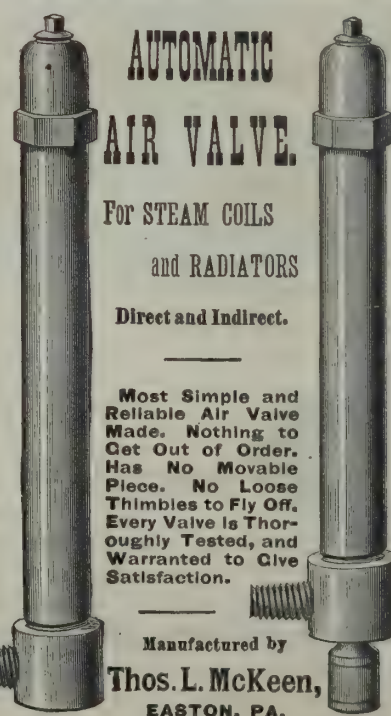
WROUGHT IRON HOT WATER BOILERS  
A SPECIALTY.

Manufactory, 381 to 393 S. Canal Street, Chicago.



The above cut is of Greenhouse Boiler, meeting  
with universal success wherever placed. Estimates  
gladly furnished for any capacity.

**PETER DEVINE,**  
387 S. CANAL ST., CHICAGO.

**AUTOMATIC****AIR VALVE.**

For STEAM COILS  
and RADIATORS

Direct and Indirect.

Most Simple and  
Reliable Air Valve  
Made. Nothing to  
Get Out of Order.  
Has No Movable  
Piece. No Loose  
Thimbles to Fly Off.  
Every Valve is Thor-  
oughly Tested, and  
Warranted to Give  
Satisfaction.

Manufactured by

**Thos. L. McKeen,**  
EASTON, PA.



# OIL WELL SUPPLY CO., Limited.

PITTSBURGH, PA.,  
OIL CITY, PA., and  
BRADFORD, PA.

MANUFACTURE AND SELL ALL KINDS OF

## Tools and Machinery

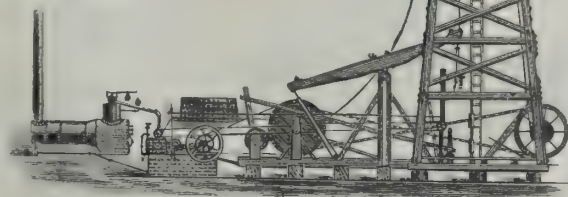
BOILERS, ENGINES, TUBING, CASING and ROPE

FOR

Drilling, Equipping, and Pumping Artesian Wells,

And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,  
NATURAL GAS,  
WATER, or STEAM.



## IMPORTANT

To Architects, Builders, House-Painters, Decorators, Boat-Builders  
and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Var-  
nishes or Wood-Finishes in  
the market, for the follow-  
ing reasons, viz.:

They possess more  
body, higher luster,  
greater resisting prop-  
erties to atmospheric  
influences, action of  
water and alkali, are  
more elastic, will not  
scratch or mar white,  
and are more durable.



For all classes

Inside Work,

Requiring great dura-  
bility, use No. 2 ELAS-  
TICA FINISH.

For

Outside Work,

Requiring extreme  
durability, use No. 1  
ELASTICA FINISH.

Manufactured by

STANDARD VARNISH WORKS,

D. ROSENBERG & SONS,

Office, 207 Avenue D, NEW YORK.

Send for Samples and Full Particulars.

# MALLORY'S STANDARD SHUTTER WORKER



Opens and closes the blinds without raising the window.  
Automatically locks the blinds in any position.  
Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

Can be applied to old or new houses, of brick, stone, or wood.

AGENTS WANTED.

Send for Illustrated Catalogue to

Frank B. Mallory, FLEMINGTON, NEW JERSEY, or  
60 LIBERTY STREET, NEW YORK.

ESTABLISHED 1844.

SAMUEL H. FRENCH & CO.,

York Avenue, Fourth and Callowhill Sts.,  
PHILADELPHIA, PA.

## PAINT MANUFACTURERS.

Strictly Pure Lead, Zinc and Colors, Dry, in Oil, Japan,  
and Ready Mixed for Use.

# PEERLESS MORTAR COLORS.

BLACK, BROWN, BUFF, AND RED.

Masons' and Builders' Supplies.

SEND FOR CATALOGUE AND CIRCULARS.

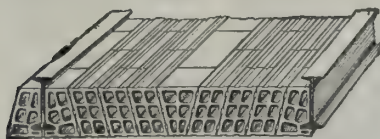
## TOCH BROTHERS

EDINBURGH RED	SOLE IMPORTERS IN THE U.S.	STONE BLACK
FRONT OIL		STONE BUFF
PURPLE		MAROON
BROWN		ACIDS
ECT.		ETC.
SPECIALS		SPECIALS

Established 1848.  
The Only Unfading  
**MORTAR TINTERS**  
Descriptive Circular and Price List on  
application.  
Office and Store, 35 BOWERY, NEW YORK CITY.

— ALSO —

Paints,  
Varnishes,  
Brushes,  
Stains,  
Etc.



(Iron Beam Protection. Patented June 3, 1884.)

HENRY MAURER & SON,

MANUFACTURERS OF

## FIRE-PROOF MATERIAL

Of every description. Hollow Brick made of Clay for  
Flat Arches, Partitions, Furring, etc. Porous  
Terra Cotta, Fire Bricks, etc., etc.

Office and Depot, 420 East 23d St., New York.

WORKS, PERTH AMBOY, N. J.



Fine Office & Bank  
Fittings

BRASS & WIRE WORK.  
A.H. ANDREWS & CO. 195 Wabash  
Ave., Chicago, and 686 Broadway, N. Y.

Screw Plates.



Send for  
CATALOGUE  
F. K. F.

Adjustable Die.



WELLS BROS. & CO., GREENFIELD, MASS.

MANUFACTURERS OF  
Screw Cutting Machinery and Tools for Machinists,  
Carriage Makers, and Blacksmiths' Use.

## THE "IDEAL"

PATENT TILE-LINED BATH-TUB.

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,

BAKER BUILDING,

1524 CHESTNUT ST., PHILADELPHIA.

Send for Illustrated Circular and References.

## MAXWELL'S Gypsum Paint



For Whitening and Coloring  
Churches, Factories, Mills, Dwell-  
ings, Barns, Fences, or for any  
purpose where whitewash or kal-  
somin is used. Made in a va-  
riety of standard colors. Put up  
in 1/2 and one gallon, also 1/4, 1/8,  
and one barrel quantities.  
A Beautiful, Durable, and  
Cheap article.  
Will stand any climate.

MANUFACTURED BY

JOHN MAXWELL,  
1603 OTSEGO STREET,  
PHILADELPHIA.

Mention this  
Paper.



## HOMES

OF  
TO-DAY

Or, MODERN  
EXAMPLES OF  
MODERATE  
COST  
HOUSES

Published in one annual and three quarterly parts.  
Annual part now ready, 96 large quarto pages, 30  
designs of buildings costing \$250 to \$12,000;  
nearly 200 illustrations; colored frontispiece, and full  
set framing plans and details of country house. A  
complete hand-book for those intending to build.  
Price, Annual Part, 50c. Each Quarterly  
Part, 25c. The four parts postpaid, \$1.00.  
F. L. SMITH, Architect, 22 School St., BOSTON.



## COSY HOMES!

How to Build Them.  
Contains 96 pages, showing  
complete designs of 10 low-  
cost houses, with valuable  
information for those who  
wish to build economically.  
The book will be mailed,  
post-paid, on receipt of Price, 25 Cents. Postal  
note, or 1 and 2 ct. stamps.

F. L. SMITH, Architect, 22 School St., BOSTON.



EDWIN LEE BROWN, Pres't.

The Western Sand Blast Co.,

Ornamenters of Glass for

VESTIBULE DOORS,

TRANSOMS,

BANK & OFFICE COUNTERS,

AND

Manufacturers of Advertising

Glass Signs.

Sand Blast & Embossed Rail-  
road Glass a specialty.

N. W. Cor. Clinton & Jackson Sts.,

CHICAGO, ILL.

Telephone 4085.



# THORN SHINGLE & ORNAMENT CO.,

SOLE MANUFACTURERS OF

The Best and Cheapest Metallic Roofing

## TILES AND SHINGLES

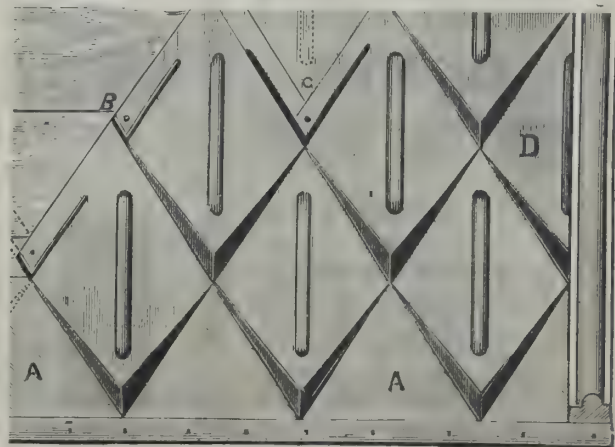
YET OFFERED TO THE BUILDING TRADE.

The Horseshoe Spring-Lock Shingle (Patten's Patent) just out. This Shingle can be put on in one-half the time it requires with  
any other shingle now in the market. Is cheap, durable, secure, thoroughly water-tight and makes a good appearance as a roof  
covering. Two (2) sizes.

THORN'S PATENT ROOFING and WALL TILES, the most perfect and Unique Roof, Gable, Tower, and Wall covering,  
yet produced in metal. On the roof in appearance they are like terra  
cotta earthen tiles, and are better, and half the cost. Four (4) designs or sizes are made.  
All the above goods are packed a square to the box and delivered f. o. b. cars in Philadelphia.  
For particulars, price lists, etc., address

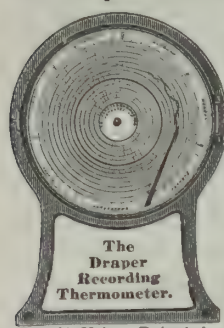
THORN SHINGLE & ORNAMENT CO.

12th & Callowhill Streets, Philadelphia, Pa.





## The Draper Recording Thermometer.



This thermometer gives a permanent and continuous record in ink of the temperature. The chart indicating hours of the day and days of the week gives the degrees of temperature from 20° below zero to 110° above. All instruments are accurately adjusted and warranted. The record is easily read and absolutely correct. Sold by the leading instrument dealers and opticians throughout the United States and Canada, and by

**The DRAPER MANUFACTURING CO.**  
Owners of the United States and foreign patents, 152 Front Street, New York

Size 14x20 in. Patented. Copyrighted.

**DRAWING INSTRUMENTS, DRAWING PAPER, BLUE PROCESS PAPER, AMERICAN LIQUID INK.**

A fully illustrated and priced catalogue of 200 pages of all instruments and materials used by draughtsmen sent upon mention of this paper.

**G. S. WOOLMAN,**

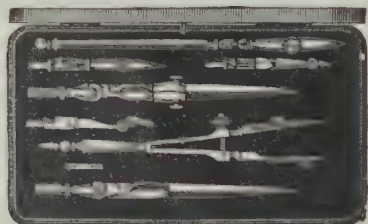
116 FULTON ST.,

NEW YORK.

**L. MANASSE,**

IMPORTER AND MANUFACTURER,

88 Madison Street, Chicago, Ill.



ARCHITECTS' AND SURVEYORS' SUPPLIES.

Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.

Improved LEVELS for Builders and Tiling.

Illustrated Catalogues Sent on Application.

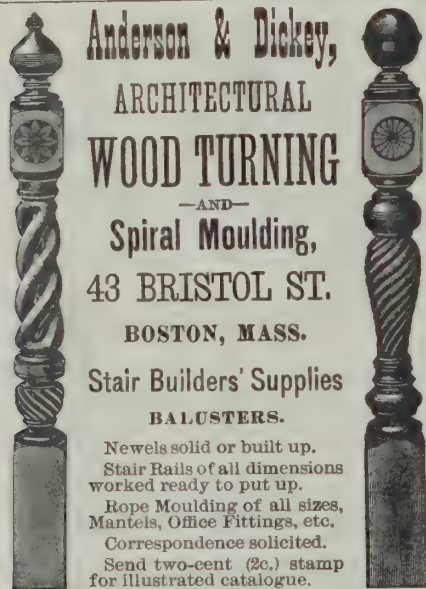
JOHN WHEELER,

CARPENTER and BUILDER

**ORNAMENTAL RUSTIC WORK.**

Medals from American Institute, And other Associations.

P. O. Box 140. Cleveland St., Orange, N. J.



**Anderson & Dickey,**

ARCHITECTURAL  
WOOD TURNING

—AND—  
Spiral Moulding,  
43 BRISTOL ST.  
BOSTON, MASS.

Stair Builders' Supplies

BALUSTERS.

Newels solid or built up.  
Stair Rails of all dimensions  
worked ready to put up.  
Rope Moulding of all sizes,  
Mantels, Office Fittings, etc.  
Correspondence solicited.  
Send two-cent (2c.) stamp  
for illustrated catalogue.

**Standard Wood Turning Co.**

58 BAY STREET,  
Jersey City, N. J.

**MACHINE-TURNED  
BALUSTERS**

Various Sizes and Patterns Dove-  
tailed ready for use, with Tait's  
Patent Dovetail.

PEDESTAL and TURNED NEWELS.

STAIR RAILS,

Of all dimensions, worked, ready  
to put up.

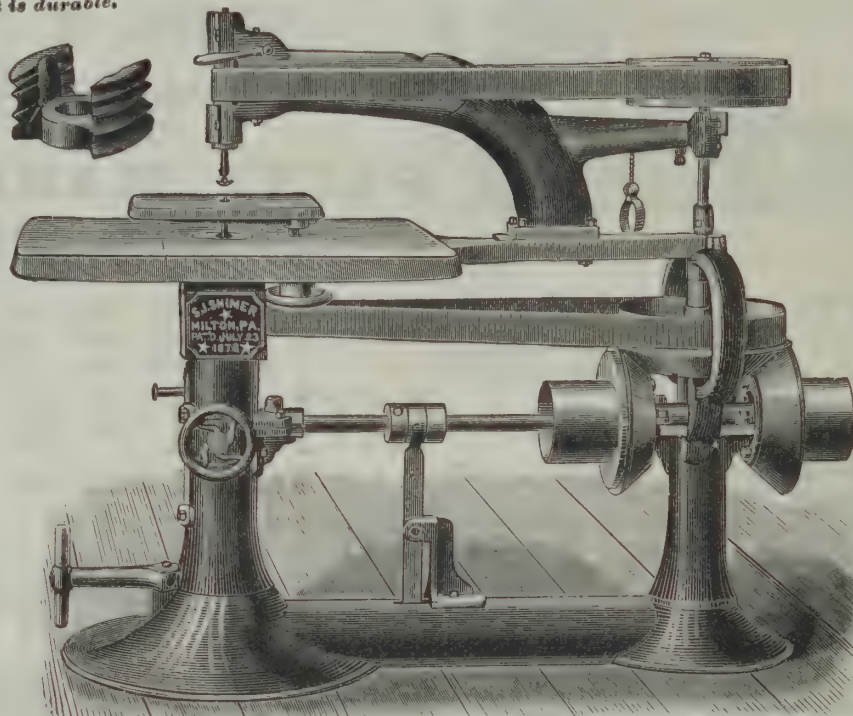
Send 4c. Stamp for our 32-page  
Catalogue, containing 200 Illustrations  
of Balusters, Pedestal Newels,  
Brackets, Drops, etc.

## Shimer's Variety Moulder, with Surface Moulding Attachment.

**FOR SINKING** panels with pattern guided by pin that automatically takes its position when you start the Machine, and drops out of the way when you stop it. The Cutter in the overhanging arm of the Machine has a perpendicular adjustment of one inch, and is operated by the handle shown in the cut attached to an eccentric lever that is automatically locked to the one position when at work.

**TO CHANGE** from Surface Moulder to Variety Moulder, disconnect the rod that runs the incline on the T lever and pin it up. Run the housing up by means of the hand wheel until it stands above the belt line, remove the one spindle, substitute the other and set screw it to the housing. Turn the small table back under the arm. Raise the arm, disconnect the shaft that runs the upper pulley, and the Machine becomes an Edge Moulder without having any of its parts unbolted and laid away.

You never tire of the make up of this Machine, which is as simple and effective as it is durable.



Reversible Cutters for any shape of mould made to order, and warranted to cut free and easy. For Circulars and full information, address,

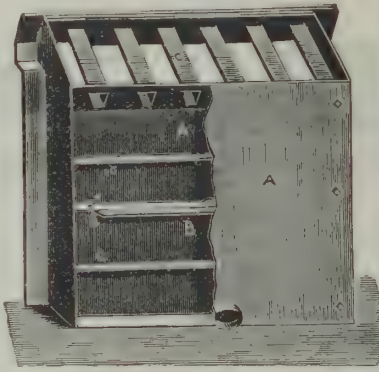
**SAMUEL J. SHIMER & SONS,**

MANUFACTURER of the SHIMER CUTTER HEADS and SPECIAL WOODWORKING MACHINERY,  
MILTON, PENN.

## The OMEGA FIREPLACE FURNACE



2<sup>nd</sup> page illustrated catalogue,  
containing full information and  
prices, sent to any address.



A Double Heater and Perfect Ventilator. A Revolution in Fireplace Heating. Gives the combined heat of both a Furnace and Fireplace, with Perfect Ventilation. Equalizes the heat in every part of the room. Burns equally well Hard or Soft Coal, Wood or Coke. Address

**OMEGA GRATE CO.,**

Pullman Building,

Chicago, Ills.



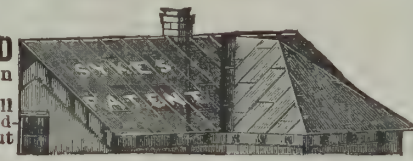
**SYKES' IMPROVED**

Best Roof in the World.

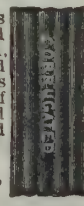
Suitable for all classes of Buildings. Easy put on.

**SYKES IRON ROOFING CO., NILES, O.**

Send for Circular and Price List, and mention this Paper.



All my Iron is Re-Rolled and Box Annealed, well Painted on both sides with Best of Paint and Pure Linseed Oil.



**ALLEN B. RORKE,**  
Contractor and Builder,

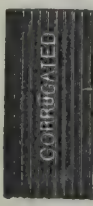
423 WALNUT STREET,  
PHILADELPHIA.

ROOM 217, STEWART BUILDING, NEW YORK CITY

**C. POWELL KARR, C.E.,**  
CONSULTING ARCHITECT,

For Acoustic Work and all matters relating to Architectural Engineering.

ESTIMATES prepared from Building Plans and Specifications furnished by Architects, Owners, Builders, or Contractors for work to be done, and material supplied in the EASTERN or MIDDLE STATES. Terms upon application.

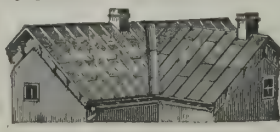


**CANTON IRON ROOFING CO., Canton, Ohio.**

MANUFACTURERS OF THE H. W. SMITH PATENT

**STEEL ROOFING.**

Made of genuine sheet steel and calaminated steel.



**CORRUGATED IRON**  
Roofing and Siding, Beaded Iron Ceiling and Siding, Crimped Edge Roofing and Siding, Roof Paint, Roofer's Paper, etc.

Send for catalogue, price list, and samples.

## ARCHITECTS

SHOULD ALWAYS SPECIFY



**Mueller's WATER PRESSURE Regulators**

to insure against the bursting of pipes and to preserve a uniform pressure throughout the building. Write for illustrated catalogue and prices.

**H. MUELLER MFG. CO.,**

220 and 222 East Main St., Decatur, Ill.

**No. 11 PLANER & MATCHER**

Double Belted and Geared Lower Rolls.

Special Machinery for Car Work and the latest improved Woodworking Machinery of all kinds.

**C. B. ROGERS & CO.**

Norwich, Conn.

109 Liberty Street,

New York.

## TO ARCHITECTS.

THE undersigned has had much experience in the making of perspectives from plans and elevations, and will promptly execute any orders, either in ink or colors as desired.

**A. F. LEIGHT,**

361 Broadway, New York.

TERMS MODERATE.

ESTABLISHED 1843.

Manufacturers of

**Stable Fittings and Fixtures,**

IMPROVED and PATENTED.

IRON, BRASS, BRONZED and NICKEL-PLATED

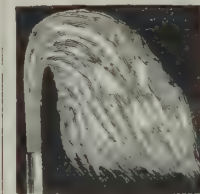
POULTRY YARD APPLIANCES, ETC.

Low estimates furnished to Architects, Builders, Carpenters, Masons, etc.

Catalogue Mailed on Application.

**SAMUEL L. BENT & SON,**

No. 111 Chambers St., New York City.



## ARTESIAN

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue.  
**Pierce Well Excavator Co.**  
New York.

## LEFFEL'S HOUSE PLANS.

CONTAINING

Elevations, Plans and

Descriptions of Houses

costing from \$500 to \$3,000, and adapted to families having good taste and moderate means. Including the six prize plans in the *Mechanical News* competition. One oblong quarto, \$2.00.

Sent by mail, postage prepaid, on receipt of the price. Address

**MUNN & CO.,** Publishers of Scientific American,  
361 Broadway, New York.



**Instantaneous Water Heater Co.**

Manufacturers of the

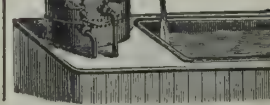
**DOUGLASS PATENT**

Instantaneous Water Heater,

FOR

Baths and Domestic Purposes.

Can be used any place where gas and water can be obtained.



210

Illinois St.,  
Chicago.



THE LATEST & BEST IMPROVED

# BRICK MACHINES

FOR BOTH STEAM AND HORSE POWER.



STEAM POWER BRICK MACHINE WITHOUT SEARING. STEAM POWER BRICK MACHINE READY FOR PULLEY.



SEND FOR ILLUSTRATED CATALOGUE

## HENRY MARTIN,

INVENTOR, PROPRIETOR, AND MANUFACTURER.

139 CHESTNUT ST.  
LANCASTER, PA., U.S.A.

HORSE POWER BRICK MACHINE.

## GIBBS' ENGLISH PORTLAND CEMENT

Is unrivalled for quality and Cheapest to use.

### INGHAM'S ENAMELED BRICKS

Are beautiful for Decoration and Interior Finish. Send for Catalogue, etc., of Novelties.

HOWARD FLEMING, 23 Liberty St., New York.



ESTABLISHED 26 YEARS

30% SAVED IN COST

PECORA MORTAR STAINS

BLACK, RED, BROWN, BUFF, PURPLE, SPECIAL

MANUFACTURED ONLY BY

S. BOWEN'S SONS,\*

150 N. 4th St., Philadelphia, Pa., U. S. A.

WILL NOT FADE OR RUN

TRADE MARK

—Send for Circular E.—

## PASSENGER ELEVATORS,

MANUFACTURED BY

### HOWARD IRON WORKS,

BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

## GRAVES' ELEVATORS,

PASSENGER and FREIGHT,

MANUFACTURED BY

### L. S. GRAVES & SON, Rochester, N. Y.

BRANCH OFFICE: 46 Cortlandt Street, New York.

THE

# WELLS PROCESS

Rustless Oxide of Iron.

The Newest and Best Process

FOR

## PROTECTING IRON.

Special and Exclusive Rights For Sale

RUSTLESS IRON WATER PIPE

SEND FOR CATALOGUE

THE WELLS RUSTLESS IRON CO.

212 CLIFTON STREET NEW YORK

Established 1858.

## H. W. JOHNS' Asbestos Patented Roofing

FIRE-PROOF.

This is the perfected form of Portable Roofing manufactured by us for the past thirty years: is adapted for use on steep or flat roofs in all climates, can be easily applied by unskilled workmen, and costs only about half as much as tin. Samples and descriptive price list free by mail.

H. W. JOHNS MFG. CO., 87 Maiden Lane, N. Y.

Chicago, Philadelphia, London.

Sole Manufacturers of H. W. Johns' Liquid Paints, Asbestos Fire-Proof Paints, Sheathings, Building Felts, Asbestos Steam Packings, Boiler Coverings, etc. VULCABESTON Moulded Piston-rod Packing Rings, Gaskets, etc.




## Mineral Wool

FOR

FIRE-PROOFING,

DEADENING SOUND,

and INSULATION of HEAT and COLD in

RESIDENCES,

COLD STORAGE, and REFRIGERATING ROOMS.

Descriptive Pamphlet and Sample Free.

ADDRESS:

Western Mineral Wool Co.,  
Cleveland, O.  
St. Louis, Mo.

## ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

Attention is called to Fireproof and Vermin Proof

## MINERAL WOOL

As a Lining in Walls and Floors for preventing the Escape of Warmth and the Deadenng of Sound.

Sample and Circular Free.

U. S. Mineral Wool Co., 2 Cortlandt Street, N. Y.

To Architects, Builders, and Owners.

## NEW YORK SAFETY DUMB WAITER FIXTURES

Patented United States, April 19th, 1887; in Canada, May 18th, 1887.

The MOST COMPLETE, SIMPLE and ABSOLUTELY SAFE WAITER made. Provided with SAFETY ROPE, AVOIDING ACCIDENT. ENTIRELY NOISELESS, and moves with perfect ease.

FIXTURES ONE SIZE ONLY, adapted to any size waiter. Can be adjusted by any CARPENTER or MECHANIC. DIAGRAM and FULL DIRECTIONS ACCOMPANY EACH SET.

HANDSOMELY BRONZED, and packed ONE SET in a BOX. Sold by the Hardware trade.

PRICE, 15.00.

For catalogue address the manufacturers.

THE EDWARD STORM SPRING CO., Limited,  
Poughkeepsie, N. Y.

or, JOHN H. GRAHAM & CO., Sole Mfrs. Agents,  
113 Chambers Street, New York.





## The Great Architect. H. H. RICHARDSON AND HIS WORKS.

By Mrs. SCHUYLER VAN RENSSELAER.  
With a fine portrait of Mr. Richardson, twenty-six full-page Heliotypes, and over seventy other sketches, full-page and smaller, illustrating Mr. Richardson's works. *The edition is limited to 500 copies.* In a quarto volume, attractively bound. \$20.00.

Mrs. Schuyler Van Rensselaer's great monograph, *Henry Hobson Richardson and His Works*, is one of the most beautiful art books ever attempted in this country, and has the special merit of being American in spirit and substance, in matter and manner, in its genius and in workmanship. In form it is a folio, the page being twelve inches wide by fifteen in height. There are ix and 152 pages of text, thirty-seven full-page illustrations, and nearly double that number in the text. Almost all the full-page illustrations are beautiful heliotypes, making a really splendid gallery of Mr. Richardson's principal works. Whether it would have been possible to find a better biographer for Mr. Richardson than Mrs. Van Rensselaer it is not easy to determine. It is manifest, however, that her work is adequate and satisfying—an extraordinary achievement, which will add to Mrs. Van Rensselaer's fame and give great pleasure to Mr. Richardson's admirers in the profession.—*Boston Beacon*.

## Building and Buildings.

BUILDING CONTRACTS, LEASES, EASEMENTS, AND LIENS. By A. PARLETT LLOYD, Esq., of the Baltimore bar, author of "The Law of Divorce." 1 vol. 8vo, cloth, \$4 50; law sheep, \$5.00.

This is the first adequate American treatise ever published on the Law of Building. Mr. Lloyd has made a careful and exhaustive study of the subject, and his work contains reference to and citations from every important English and American case upon matters relating to building. It is a plain, clear statement of the law as enacted by legislation and decided by the courts, and is a work of great value to builders.

\* \* For sale by all Booksellers. Sent by mail, postpaid, on receipt of price by the Publishers.

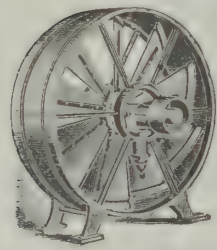
HOUGHTON, MIFFLIN & CO., Boston,  
11 East Seventeenth Street, New York.

## SEBASTIAN, MAY & CO., Manufacturers of and Dealers in

### Hand and Foot Power Machinery

For CARPENTERS, BUILDERS, MACHINISTS, etc.  
183 W. Second St., Cincinnati, O.

Write for our New Catalogue, just issued.



Clark's New Drying Exhaust and Ventilating Fans.  
PATENT ADJUSTABLE WINGS.

Capacity Quickly Increased or Diminished.  
Self-Oiling Bearings. Light Running.  
Durable.  
PRICE LIST FREE.

GEO. P. CLARK, (Box A), Windsor Locks, Ct.  
JAMES GOLDSMITH, New York Agent, 744 BROADWAY.

## E. J. JOHNSON, SLATE BLACKBOARDS, — ROOFING SLATE.

SLATE ROOFERS' SUPPLIES.  
HEARTHES, SILLS, LINTELS, STEPS, MANTELS.

Special orders will receive prompt attention. Send for estimates.

Quarry: Bangor, Pa.

Office: 18 Burling Slip, New York.

Send for descriptive circular of Indestructive Slate Roof for Flat Roofs only.



## American Foundry Practice.

Treating of Loam, Dry Sand, and Green Sand Moulding, and containing a Practical Treatise upon the Management of Cupolas and the Melting of Iron. By Thomas D. West, Practical Iron Moulder and Foundry Foreman. Sixth Edition, with Index, fully illustrated, 12mo, cloth. \$2.50.

"One hundred items that apprentices should know and remember, alone are worth the price of the whole work. \* \* It is not written with a special view to instructing apprentices, but as a handbook for men who have learned the trade."—*American Machinist*.

"Mr. West thoroughly understands the details of his trade and the snares and pitfalls which beset inexperienced journeymen, who will find in this work the solution of many vexatious and incomprehensible things."—*Mechanical Engineer*.

## Moulder's Text-Book:

BEING PART II. OF

### American Foundry Practice.

Presenting Best Methods and Original Rules for Obtaining Good, Sound, Clean Castings, and Giving Detailed Description for Making Moulds Requiring Skill and Experience: also containing a Practical Treatise upon the Construction of Cranes and Cupolas, and the Melting of Iron and Scrap-Steel in Iron Foundries. By Thomas D. West. Fully Illustrated and with Complete Index. Third Edition, 12mo, cloth. \$2.50.

"It contains 460 pages, and the matter is equally as good as that of the first volume (American Foundry Practice)—in fact, we think it better, if possible. Under the head 'American Cupola Practice' forty-six reports of the working of cupolas are given, the cupolas being in thirty-six States. In these, complete dimensions of the cupolas, size, speed of blowers, time of starting fires, charging iron and coal, time of melting, iron melted and fuel used, and other particulars are noted."

"FOUNDRY CRANES.—But little has been published on this subject, and what the author gives from experience will doubtless be appreciated. Altogether, the book is one that every moulder and every one interested in such matters should possess."—*American Machinist*.

Mailed and prepaid on receipt of price. Catalogues gratis.

JOHN WILEY & SONS,  
15 Astor Place, New York City.

N. B.—Any one willing to engage as a canvasser for these volumes can ascertain our terms on application.

## Superior Copper Weather Vanes GILDED WITH PURE GOLD.

TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.



Vanes made from any Drawing or Design on Short Notice.

T. W. JONES,

SUCCESSOR TO

CHAS. C. BRIGGS,

V. W. BALDWIN,

Removed from 213 Pearl

Street to

170 & 172 Front St.,

Near Maiden Lane,

NEW YORK.

Illustrated catalogue of over 250 designs, mailed to any address on receipt of a two cent stamp, half the postage.

## Notes and Queries.

(1) J. J. C. writes: I am living in a new house and I am troubled with ants; will you please inform me what I should do to get rid of them? A. Bunches of green tansy strewn around are said to be an effectual remedy for those pests.

(2) F. S. D. B. writes: In a round chimney 335 feet high, 28 feet diameter at the base, and 14 feet at the apex, how much will be the oscillation of the chimney at the apex? A. The oscillation of a chimney of your description from unequal heating by the sun depends much upon the thickness of the walls, thin walls oscillating more than thick one. For such a chimney properly constructed, 2 to 3 inches would probably cover the movement in this latitude.

(3) C. C. C. asks: Could a speaking tube 1 inch pipe be made to work effectually at a distance of 3,000 feet with only 1 elbow at each end? A. No. About 150 feet is as far as a one inch speaking tube will work to advantage. For a distance of 3,000 feet a 12 or 15 inch pipe would be required.

(4) J. A. H. asks: Is there any means of preventing rain water stored in wooden cisterns from becoming foul? A. Use charcoal of about the size of beans, with the dust sifted out, with which cover the surface of the water in the cisterns. This is the only antiseptic that we can suggest that does not interfere with the use of the water for all purposes. The cistern may be much improved, at the next cleaning, by washing the wooden surfaces, sides, bottom, and top, perfectly clean, and brushing a thin coat of pure Portland cement all over the surfaces. Mix quickly with water to a creamy consistency, and spread with a whitewash brush. Let it set for a few hours and go over it again. In one day the cement will be set and the cistern ready for use.

(5) D. C. S. asks: 1. Is there any wash that I can use to wash lime stains out of oak? A. No. 2. Is there any kind of wash that I can apply to oak or cherry to prevent lime and plaster from staining them? Coat them with paraffin, and the lime will not go through.

(6) S. E. M. asks (1) whether a bed room cannot be perfectly ventilated by one open window, the shutters being closed and the slats of the shutters open, that is, horizontal. I am told that a room to be well ventilated requires two openings, but do not the open slats of the two shutters afford these openings, one for the entrance for pure air, the other for the exit for respired air? A. Whether a room can be ventilated by a single window depends on the size of the room and on many other factors. The shutters only impede ventilation. 2. Can the human voice be cultivated without a master? Are there no books, reliable and good, which one could follow and escape the expense of a music master? A. We believe the voice cannot be properly cultivated without a teacher. We can supply you with "Orthophony, or Vocal Culture," by Professor Francis T. Russell. Price \$1.50.

## THE TIFFANY GLASS COMPANY

MEMORIAL WINDOWS  
GLASS WORK DECORATIONS

Designs and Estimates submitted.

333-335 Fourth Ave., New York City.

## J. B. Lippincott Co.'s New Publications

### THE CHEMICAL ANALYSIS OF IRON

A Complete Account of All the Best-Known Methods for the Analysis of Iron, Steel, Pig-Iron, Iron Ore, Limestone, Slag, Clay, Sand, Coal, Coke, Furnace and Producer Gases. By ANDREW ALEXANDER BLAIR, Chief Chemist United States Board appointed to Test Iron, Steel, and other Metals, 1875; Chief Chemist United States Geological Survey and Tenth Census, 1880. Octavo. Handsomely Illustrated. Extra cloth. \$4.00.

Considering the enormous extent of new iron and steel industries, and their dependence upon chemistry, this work should be a welcome addition to the literature of the subject. It is intended as a text-book for students of iron-chemistry, and as a book of reference for analytical chemists interested in this branch of the profession. It contains a description of many forms of useful apparatus and the means for preparing and testing all the reagents required in the analysis of iron, and also includes a chapter on the technical analysis of furnace and producer gases. The author's official relations have given him unusual advantages in this class of work, and the methods described embrace not only the elaborate and exact ones necessary for scientific purposes, but all the rapid processes in use at steel works.

"It is a hand-book which will be found invaluable by the metallist, and may be considered the best book of the sort in the market."—*Boston Courier*.

"A technical work that has cost a good deal of study, and it ought to find ready sale among ironmasters and analytical chemists."—*The Wisconsin, Milwaukee*.

### THE ANIMAL LIFE OF OUR SEA-SHORE.

With Special Reference to the New Jersey Coast and the Southern Shore of Long Island. By ANGELO HEILPRIN, Professor of Invertebrate Paleontology at the Academy of Natural Sciences of Philadelphia; author of "The Geological Evidence of Evolution," "Town Geology," "The Lesson of the Philadelphia Rocks," etc. Fully Illustrated. 12mo. Cloth. \$1.25. Paper. 60 cents.

A volume of this nature has long been a desideratum with visitors and residents at the seaside, and an acquaintance with its contents will add very much to the pleasure of every ramble along the beach. The various forms of animal life which are constantly attracting attention—their nature, uses, habits, resorts, etc.—are accurately described in an easy, attractive and popular style, free from technicalities. The volume is very readable, and will prove an agreeable change for those surfeited with the ordinary summer light reading, and a fruitful source of information and amusement to all who are interested in the study of nature. The numerous illustrations, which render the identification of specimens very easy, add materially to the value of the work.

"A work that will certainly prove extremely interesting to all during their summer vacations. It may be relied upon as being thoroughly accurate, and tells just what you want to know."—*New York Science*.

"A valuable and pleasant little hand-book. It is cheap, untechnical, well illustrated, soundly scientific, and is just the thing for any seashore wayfarer or resident who has the intelligence and taste to care to look into the wonders of the deep."—*New York Graphic*.

If not obtainable at your Booksellers', send direct to the Publishers, who will forward the books, post-paid, on receipt of the price.

J. B. LIPPINCOTT CO., Publishers,  
715 & 717 Market St., Philadelphia.

## THE American Architect & Building News

An illustrated weekly journal.

Yearly subscription to regular edition,	\$6.00
" " " " " " " " " " " "	7.00
" " " " " " " " " " " "	1.75
" " " " " " " " " " " "	10.00

Bound volumes (cloth), \$9.00 to \$10.50, according to date of issue.

Fromentin's (Eugène) The Old Masters of Belgium and Holland. 8vo. With eight full-page Heliotypes. Translated by Mrs. Mary C. Robbins. \$3.00.

Fuller's (Albert W.) Artistic Homes in City and Country. Fourth Edition. Oblong folio. 76 full-page illustrations. \$4.50.

Gardner's (E. C.) Homes and all about them. 3 vols. in 1. Profusely illustrated. 12mo. \$2.50.

Clark's (T. M.) Building Superintendence. 8vo. With Plans, etc. \$3.00.

Hoyt's (William E.) Household Sanitation. 16mo. 30c. Paper covers. 15c.

Home Sanitation. A Manual for Housekeepers. 1 vol. 16mo. 50c.

Langley's (Samuel Pierpont) The New Astronomy. Royal 8vo. Gilt top and rough edges. Richly illustrated. \$5.00.

Morse Collection of Japanese Pottery (The). By Sylvester Baxter. 4 full-page Heliotypes and numerous Vignettes. Folio, in paper covers. \$1.00.

Morse's (Edward S., Ph.D.) Japanese Homes and Their Surroundings. 8vo. With 300 illustrations. \$5.00. Half-calf, \$9.00. New Library edition, \$3.00. In half-calf, \$6.00.

Picturesque Sketches. Statues, Monuments, Fountains, Cathedrals, Towers, etc. 1 vol. oblong folio. \$1.50.

Index (Decennial) to Illustrations in the American Architect and Building News. 1876-85. 8vo. \$2.00.

Ware's (Professor William R.) Modern Perspective. A treatise upon the Principles and Practice of Plane and Cylindrical Perspective. 1 vol. 12mo. With Portfolio of 27 plates. \$5.00.

Sent, post-paid, on receipt of price.

TICKNOR & CO.,  
BOSTON.

# The Old Bangor Slate Company

F. C. YARNALL, President,  
PHILADELPHIA.

J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawed Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.



## New Combination Dividers.

Forming Dividers with short and long extension points (pencil may be used in connection with either), Outside Calipers, Inside Calipers and Hermaphrodite Calipers.

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard, tough, strong, and finely finished.

The joint is large and firm. The quadrant is round and fastened by an improved method. The steel points are tempered by a process which leaves them hard and tough. On the threaded end of the quadrant, between the adjustable legs, is a knurled nut, against the inside of which a helical spring acts. After the points are adjusted the nut may be turned back against the leg, LOCKING IT FIRMLY.

A common pencil fits either socketed leg, while an auxiliary holder is also furnished to fit reversed end of either point. This is one of the most useful combinations of the kind, as well as the BEST MADE tool ever produced.

Send Stamp for Illustrated Price List of Fine Tools for Mechanics.

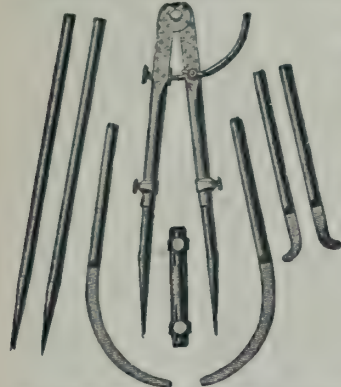
**L. S. STARRETT,**

MANUFACTURER OF

Combination Squares, Caliper Squares, Bevel Protractors, Thread Gauges, Steel Rules, Surface Gauges, Scratch Gauges, &c., &c.

Full Line of Callipers and Dividers, best on the market.

**ATHOL, MASS.**



STARRETT'S NEW COMBINATION DIVIDERS.



## Warren's Natural Asphalt Roofing.

Superior to all others for Flat Roofing.  
Over 20,000,000 square feet used within 10 years.

This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.

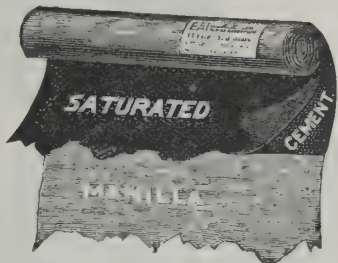
### "COMPOSITE" FELT.

For Roof Foundations.

A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is absolutely impervious to moisture; for use under slate, shingles, etc., it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete waterproof covering.

Send for samples and Circular No. 2.

**WARREN CHEMICAL & MFG. CO. No. 114 John Street, New York.**



**GLASS**

PHILLIP SEMMER GLASS CO. LTD.  
PLATE SHEET & LOOKING GLASS DEPOT  
No. 12 & 14 DESBROSSES ST.  
WRITE FOR QUOTATIONS. NEW YORK.

## PARTRICK & CARTER, ELECTRICAL SUPPLIES

SOLE PROPRIETORS OF THE PATENT NEEDLE ANNUNCIATORS AND BURGLAR ALARMS  
WE MAKE A SPECIALTY OF BELLS, DISQUE LECLANCHE BATTERIES GAS-LIGHTING APPARATUS AND A FULL LINE OF SUPPLIES FOR ELECTRIC BELL WORK  
WE PUBLISH CATALOGUES OF ALL OUR MANUFACTURES, AND WILL FORWARD TO ANY ADDRESS UPON APPLICATION.  
WHEN APPLYING FOR CATALOGUES, PLEASE STATE WHETHER ELECTRIC BELL OR GENERAL ELECTRICAL SUPPLY CATALOGUE IS WANTED, AND IF IN THE TRADE INCLUDE BUSINESS CARD FOR DISCOUNTS.  
114 SOUTH SECOND STREET. PHILADELPHIA, PA.

## ADAMANT WALL PLASTER.

MANUFACTURED BY

**Adamant Manufacturing Company.**

OFFICE

63 EAST GENESEE STREET, SYRACUSE, N. Y.

## The New, Cheap, and Only Superior Substitute for Common Plaster.

It is hard as marble, and will last as long as the building.  
It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.  
It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.  
It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.  
It does not crack or fall off, even in case of leakages.  
It is applied easily by any good mason.  
It is the only material with which repairing can be done neatly and "to stay."

For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,  
For Pennsylvania, KEYSTONE PLASTER CO., 233 No. 23d St., Philadelphia,  
or, " " " " Williamsport, Pa.  
For Massachusetts and Rhode Island, BAY STATE ADAMANT CO., 164 Devonshire St., Boston, Mass.  
For Connecticut, CONNECTICUT ADAMANT CO., 480 Grand Avenue, New Haven, Conn.  
For New Jersey, NEW JERSEY ADAMANT CO., 61 Passaic Avenue, Harrison, N. J.

### THE PRENTICE METALLIC HIP SHINGLE

Patented Sept. 21, 1886.  
Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow-tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application. Price \$3.00 per hundred. Small lots sent by express C. O. D. When ordering give pitch of roof. Liberal discounts to dealers and agents. Send for circulars. Address  
**Metallic Hip Shingle Co., Toledo, O.**  
Sole Manufacturers. Lock Box 184.  
Orders promptly filled.

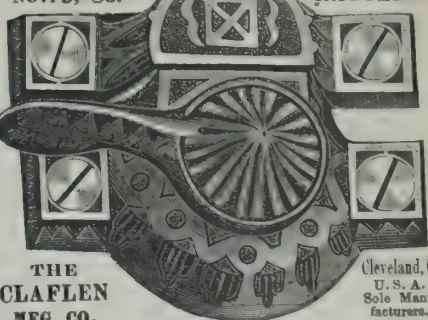
Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.

**J. DUNFEE & CO.,**  
Wood Carpet and Weather Strips  
OF ALL KINDS,  
102 Washington Street, - CHICAGO.  
SEND FOR CATALOGUE.  
Factory, 204 to 212 South Clinton Street.

### Security Sash Lock.

PATENTED  
Nov. 9, '86.

ANTI-RATTLER.



THE  
CLAFLEN  
MFG. CO.

Cleveland, O.  
U. S. A.  
Sole Manufacturers.

### The New Catalogue of Valuable Papers

contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.  
MUNN & CO., 361 Broadway, N. Y.

DETROIT, MICH, June, 1888.

DEAR SIR:

You are a user of tools. In purchasing you consider the quality, the time of delivery, and the price. We understand your position and solicit your orders.

We are in the Tool and Light Machinery business, and carry a full line of what we term Standard Tools, all of the best quality.

For special tools we offer you the advantages of a large and complete variety, comprising all of the latest improved and patented novelties and labor saving articles, and the largest line carried in the United States.

Our catalogue of tools, which is the most complete one ever issued (contains 200 pages and over 700 illustrations), will be mailed to any address upon receipt of 8 cents in stamps for postage.

Increase of business and duplicate orders from all parts of the country show that our prices are satisfactory.

We hope to receive at least a sample order from you, and will give same our careful and prompt attention. If you do not see your way to ordering at once, we invite your correspondence, and will consider and do all we can to remove any obstacles that you may see in the way.

Yours respectfully,

**CHAS. A. STRELINGER & CO.**

### THE BACKUS



WATER MOTOR

### THE BACKUS MOTOR

Is the cheapest power known for driving all kinds of light machinery. Thousands in use the world over. Speak for themselves. Sold with or without a governor. It is noiseless, neat, compact, and runs without attention.

### THE BACKUS EXHAUSTER

A wonderful Air Mover. Invaluable for ventilating factories and public buildings. Will remove smoke, dust, steam, foul air, acids, and is used for drying, heating or cooling. Send for Special Catalogue.  
**BACKUS WATER MOTOR CO., Newark, N. J.**

### THE BACKUS

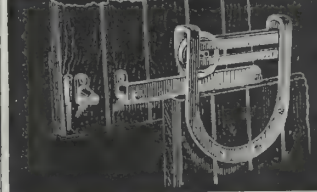


EXHAUSTER

## LANE'S PATENT STEEL DOOR HANGER

The most perfect Anti-Friction Hanger in the Market.

### BECAUSE



It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

### LANE'S PATENT TRACK

Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

Manufactured by **LANE BROS.,** Poughkeepsie, N. Y.  
**JOHN H. GRAHAM & CO.,** General Agents, 113 Chambers St., N. Y.  
SOLD BY HARDWARE DEALERS GENERALLY.



**PANCOAST & ROGERS,**

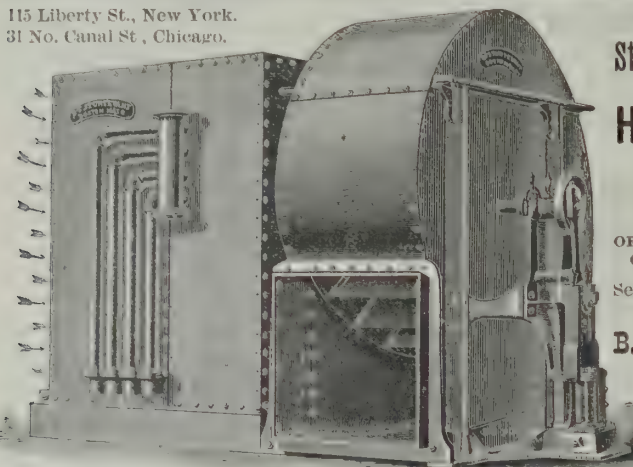
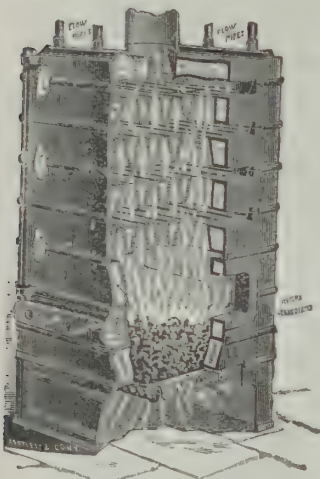
GENERAL AGENTS FOR

**READING IRON WORKS,** Wrought Iron Pipe, Boiler Tubes, Artesian and Oil Well Tubing, Casing, Line Pipe, etc. Special work of every kind in Wrought Iron**CHAPMAN VALVE MFG. CO.** Valves and Gates for Gas, Steam, Water, Oil, etc.,  $\frac{1}{8}$ " to 48" diam. Fire-Hydrants.**THE WATERBURY MALLEABLE IRON CO.** Malleable and Gray Iron Fittings for Gas, Steam, and Water.

MANUFACTURERS' AGENTS FOR

**CAST IRON WATER & GAS PIPES, SPECIAL CASTINGS,**  
And Dealers in Supplies of Every Description.

Office &amp; Warehouse, 28 Platt &amp; 15 Gold Sts., New York.

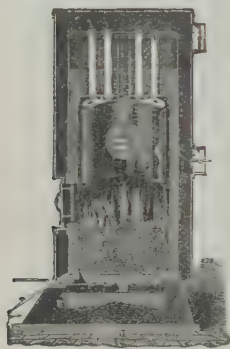
115 Liberty St., New York.  
31 No. Canal St., Chicago.**THE STURTEVANT  
Steam Hot Blast Apparatus  
FOR  
HEATING and  
VENTILATING  
BUILDINGS**OF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.Send for Illustrated Treatise on  
Ventilation and Heating.**B. F. STURTEVANT,  
BOSTON, MASS.**BRANCHES:  
New York. Chicago.**"PERFECT"**

TRADE MARK

**Hot Water  
Heater.****Hot Water**, as a medium for heating **Private and Public Buildings**, is largely engrossing the attention of the **public**, as being more satisfactory and certain in its operation, and more easily managed than **Steam**. Having constructed a **Hot-Water Heater** that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

**Richardson & Boynton Co., Mrs.,**  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.**The Globe Steam Heater**

Has been thoroughly tried in many private and public buildings and always found to be the best. Very economical, and easily managed. Large surface exposed directly to the fire. Ask for all particulars before you place your order for any other.

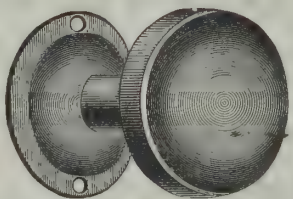
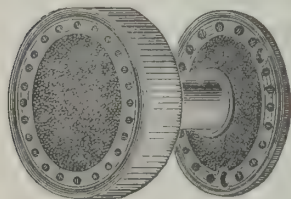
**THE GLOBE SAFETY DAMPER REGULATOR SHOULD  
BE USED ON EVERY STEAM HEATER IN USE.**

For new Illustrated Price List of Globe Steam Heating Appliances, address

**Globe Steam Heater Co., North Wales, Pa.****HEMACITE.**Easily the Best and  
Handsomest

Interior Door-Handle

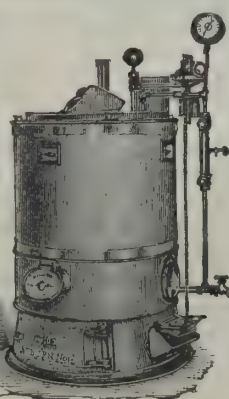
Address

**DIBBLE MFG. CO.,  
Trenton, N. J.****THE IMPROVED  
Auburn Boiler**

—FOR—

**Steam or Hot Water.****AUTOMATIC, SELF-FEEDING, PORTABLE.**

Requires attention but once in from twelve to twenty-four hours. Fuel magazine surrounded by water. Self-locking shaking grate. Waste of coal impossible. No dust. No gas.

**Woodcock & Co., Auburn, N. Y.**

HEATER.

**THE  
Woodcock Patent Shaking Grate,**

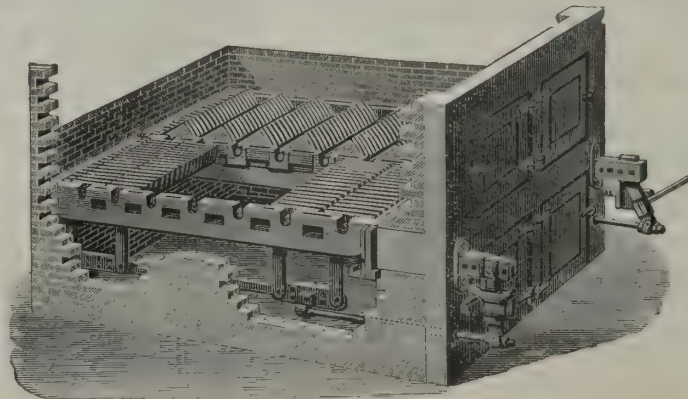
FOR

**BOILER FURNACES**

OF ALL DESCRIPTIONS.

Saves its cost in a year, supplanting all other shaking grates. No waste of coal. No burnt or broken grates. Self-locking, and as nearly automatic as a grate can be made.

Send for Illustrated Catalogue.

**Woodcock & Co., Auburn, N. Y.**

WOODCOCK PATENT SHAKING AND DUMPING GRATE.

**THE BOYNTON FURNACE CO.**

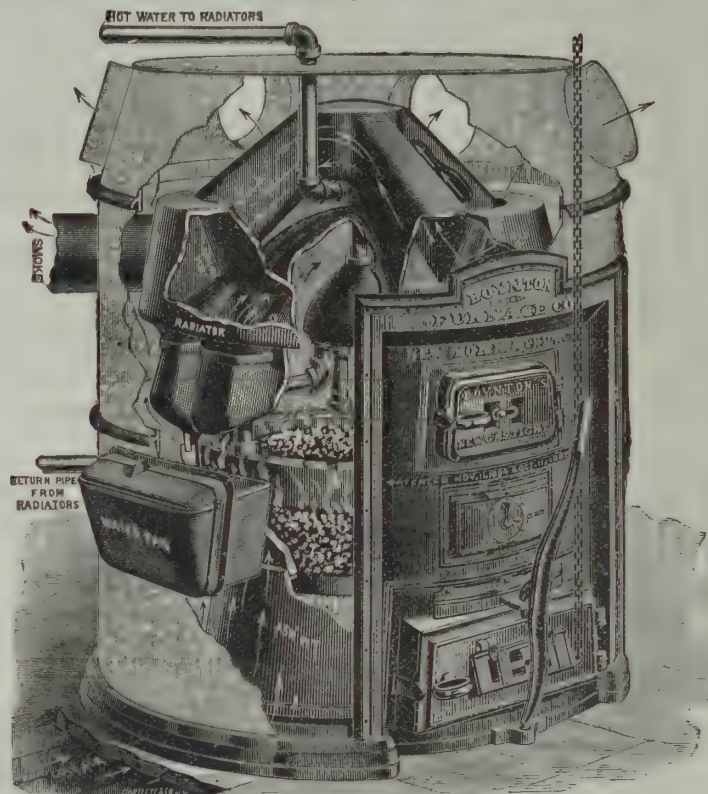
207 &amp; 209 WATER STREET, NEW YORK;

47 &amp; 49 DEARBORN STREET, CHICAGO, ILL.,

—SOLE MANUFACTURERS OF—

**Boynton's "New Gas Tight" Self-Clearing Hot Air  
Furnace with Hot Water Combination.**

Patented October 11th, 1887.

**THOROUGHLY TESTED, AND NO EXPERIMENT!**

Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

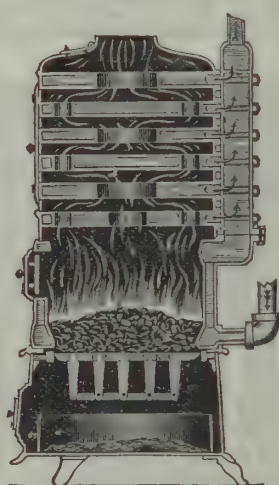
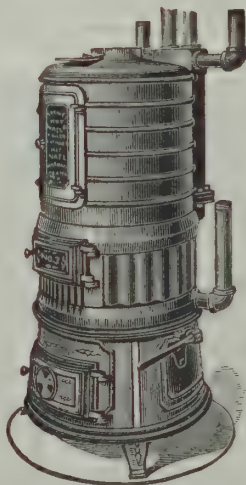
The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The **HOT WATER HEATER** is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or all Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.



SEND FOR DESCRIPTIVE CIRCULARS.

**National Hot Water Heater Company,**

MANUFACTURERS OF

**The Spence Hot Water Heaters,**

191 Fort Hill Square, Boston, Mass.

ESTABLISHED 1836.

**BARSTOW STOVE COMPANY,**

—MANUFACTURERS OF—

**Cast Iron and Steel Plate Furnaces,  
Portable and Brick Set Ranges, Parlor  
Stoves, and Baltimore Heaters.**

SEND FOR ILLUSTRATED CATALOGUE.

**BARSTOW STOVE CO.,**230 Water Street, NEW YORK; 56 Union Street, BOSTON;  
PROVIDENCE, R. I.



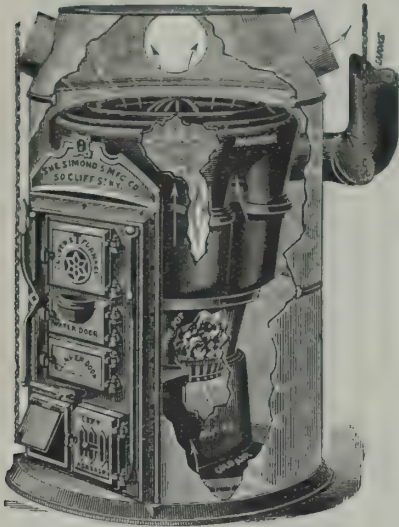
Established 1845.

# THE SIMONDS MANUFACTURING CO.

50 Cliff Street, New York.

Furnaces,  
Ranges,  
AND Registers.

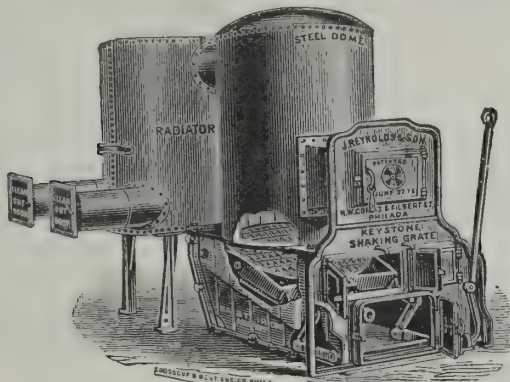
SEND FOR  
Catalogues and Price Lists.



"The Best is the Cheapest."

"A Perfect Furnace at Last."

Keystone Steel Furnaces,  
Air Tight Steel Furnaces,  
Manufactured by J. REYNOLDS & SON,  
13th and Filbert Sts., Philadelphia.



These Furnaces are supplied with **THE "REYNOLDS CLINKER CUTTING GRATE"** with Patent Dumping Attachment, the best **LABOR** and **FUEL SAVING** invention ever applied to **HEATING APPARATUS**. It is perfection. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly **GAS, SMOKE** and **DUST TIGHT**.  
**SEND FOR CIRCULAR.**

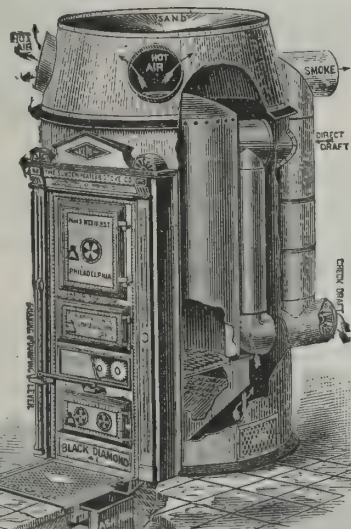
## Black Diamond Steel Dome Furnaces.

ALL SIZES.

Patent Self-Cleaning Ash Pit  
Obviates labor, dirt, and annoyance. Sure preventive from fire caused by hot ashes.

Patented and Manufactured by

The Schoen Heater  
and Stove Co.



PORTABLE and  
BRICK SET.

Common Sense Clinker-Crushing Grate. Great saving of labor and fuel.  
Perfect Dump

Office and Salesroom

13 North Eleventh St.  
Philadelphia.

SEND FOR ILLUSTRATED CATALOGUE.  
AGENTS WANTED IN EVERY TOWN.

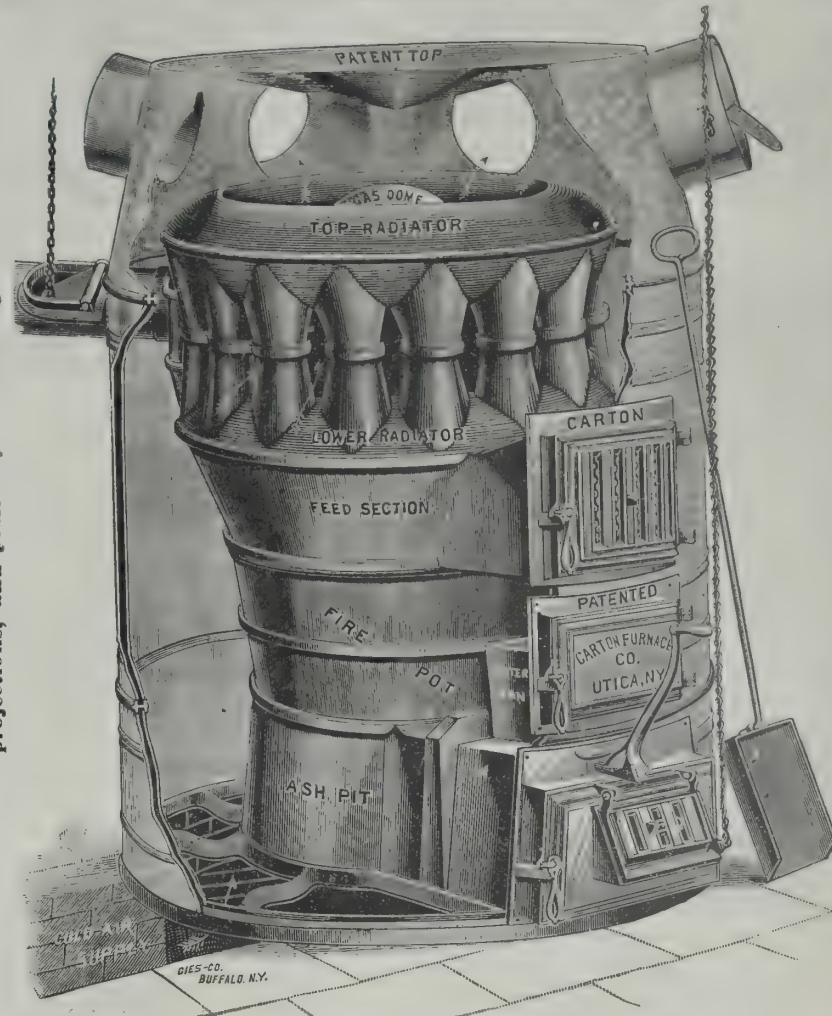
### ARCHITECTURAL PERSPECTIVES.

Architects and Builders who have plans which they desire to have put into perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

MUNN & CO., Scientific American Office, 361 Broadway, New York.

## NEW "CARTON" WITH RETURN-FLUE.

Return-Flue constructed without bolts, without dampers, without horizontal projections, and positively self-cleaning.

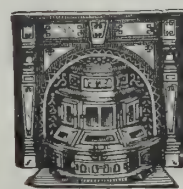


All Cast Iron. Self-cleaning. Two Radiators and No Bolts used. Immense Radiating Surface. "Happy Thought" Revolving "Duplex Grate," NO CLINKERS.

New Catalogue for 1888 now ready. Send for one.  
Sole Owners and Manufacturers,  
**CARTON FURNACE CO.**  
UTICA, N. Y.

Established 1847.

Incorporated 1883.



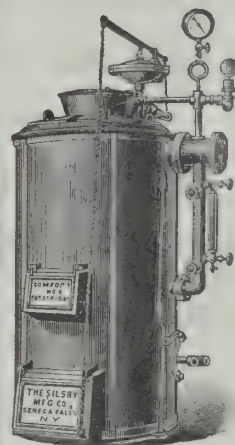
**BIBB'S** Celebrated Original  
**BALTIMORE**  
**FIRE PLACE HEATERS**  
To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world. THE B. C. BIBB STOVE CO. Stove Founders, Baltimore, Md. MARBLEIZED SLATE MANTELS. Send for Circulars and prices.

### Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish Plans and Specifications for Buildings of every kind, including Public Buildings, Churches, Schools, Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address  
**MUNN & CO., 361 Broadway, New York.**

## STEAM HEATERS.



The most Reliable, Durable, and Economical in the market.

Simple, Cheap, Safe.

Require no brick work.  
Are absolutely automatic.

A servant or child can manage them.

Send for Illustrated Catalogue.

**The Silsby Manuf'g Co.,**  
221 FALL STREET,  
SENECA FALLS, N. Y.

## RICHMOND WEATHER STRIP CO.

MANUFACTURERS OF  
**ROWLETT'S INDEPENDENT**  
**AUTOMATIC COUNTER-BALANCED**  
**WEATHER STRIP.**



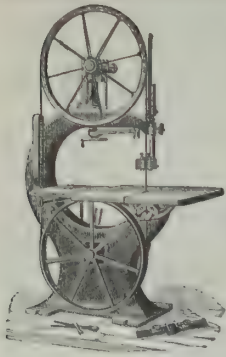
AWARDED BRONZE MEDAL AT CINCINNATI INDUSTRIAL (EXPOSITION 1884)  
HAS NO SPRINGS, TRIGGERS OR CIRCLE IRONS; POSITIVE ACTION; CANNOT GET OUT OF ORDER; FITS ANY DOOR.  
AGENTS WANTED IN EVERY CITY AND TOWN IN THE U.S. SEND FOR CIRCULAR. SAMPLE STRIP, PREPAID TO ANY PERSON ON RECEIPT OF \$1.00. ADDRESS  
**RICHMOND WEATHER STRIP CO., RICHMOND, IND.**  
P.O. BOX 282. FACTORY 217 N. 6TH STREET. MENTION THIS PAPER.



Eight Foot Eave Trough and Gutters.  
**HATTEN, GALPIN & CO., BINGHAMTON, N. Y.**

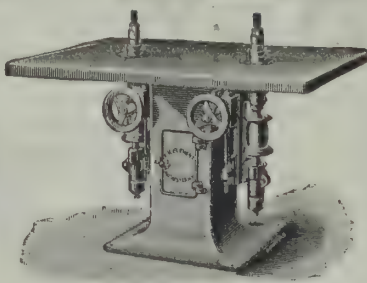
**HATTEN, GALPIN & CO.**





## CARPENTERS' AND BUILDERS' WOODWORKING MACHINES.

Planers, Saws,  
Lathes, Shapers  
Combination  
Machines,  
Shafting, Pulleys, etc.  
ENTIRE OUTFITS.  
F. H. CLEMENT,  
119 MILL ST.,  
ROCHESTER, N. Y.



## WILLER'S PATENT INSIDE SLIDING BLINDS

ARE ACKNOWLEDGED THE  
STANDARD SLIDING BLINDS  
OF THE COUNTRY.

They are used in preference to any other  
by the  
LEADING ARCHITECTS.

THEY ARE THE ONLY SLIDING BLINDS GIVING

Universal Satisfaction.

For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**

Sole Manufacturer,

Fourth and Cedar Streets, Milwaukee, Wis.

AGENTS WANTED EVERYWHERE.

State your business when writing for catalogue or agency.

EDWARD FORD, PREST.  
A. PITCAIRN, VICE-PREST.

E. L. FORD, SECY.  
JOHN F. SCOTT, TREAS.

## PITTSBURGH PLATE GLASS CO.,

CREIGHTON, PA.,

MANUFACTURERS

## POLISHED PLATE GLASS.

Ground and Rough Plate Glass for Floors and Skylights.

Three-sixteenths thickness, made expressly for fine residences.

## LARGE AND WIDE GLASS A SPECIALTY.

The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.

## IMMENSE PRODUCTION.

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.

The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.

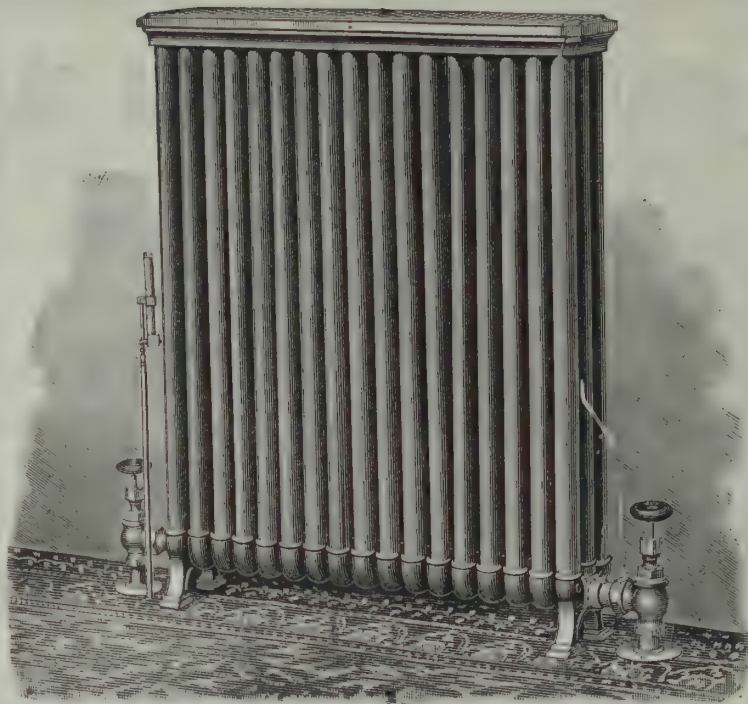
—CORRESPONDENCE SOLICITED.—

Works No. 1,  
CREIGHTON, PA.

Works No. 2,  
TARENTUM, PA.

WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL  
OFFICE, CREIGHTON, PA.

**THE BRIDGEPORT WOOD FINISHING CO**  
G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN.  
NEW YORK BUSINESS OFFICE, 96-98 MAIDEN LANE. MANUFACTURERS OF  
**WHEELER'S PATENT WOOD FILLER.**  
BREINIG'S LITHOGEN SILICATE PAINT  
LITHOGEN PRIMER, WOOD STAINS  
SILEX FLINT AND FELDSPAR.  
PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.



**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
STEAM HEATING ENGINEERS.

Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.

## ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

**MUNN & CO., Publishers,**  
361 Broadway, New York.

## HARTMAN'S PATENT INSIDE SLIDING WINDOW BLIND.



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

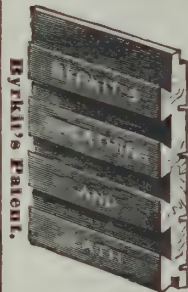
Agents wanted everywhere.

Send for illustrated Catalogue and prices to

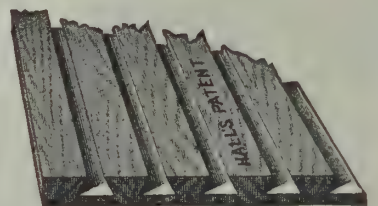
**Hartman & Darstine,**  
WOOSTER,  
Ohio,  
Mfrs for U. S. A.

**Withrow & Hillock,**  
TORONTO, Can.,  
Mfrs. for the Dominion of Canada.

## HOW TO BUILD A PERFECT HOME WITH VERY LITTLE COST.



USE  
COMBINED  
SHEATHING  
LATH.



Hall's Patent.

It makes a cheaper, warmer and stronger house than brick or stone. It is a dry and therefore a healthy house. The plaster will not crack. Architects and Builders specify it all over the country.

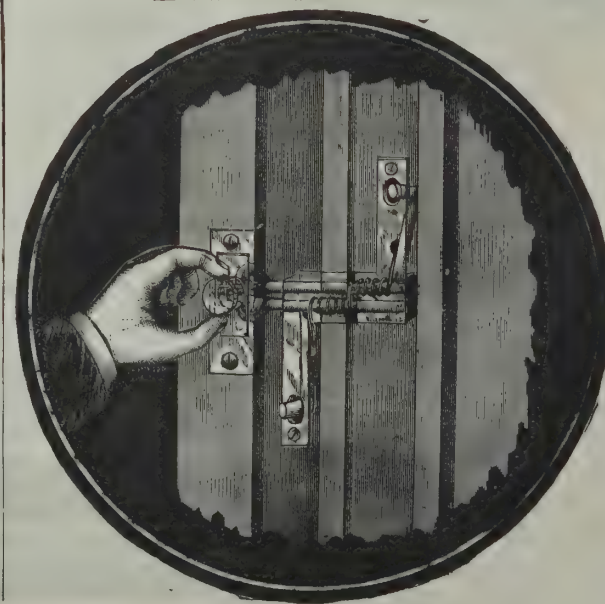
ADDRESS

**The Byrkit-Hall Sheathing Lath Co.,**

226-228 LA SALLE STREET, Room 28, CHICAGO, ILL.

For Eastern and New England States, address

**I. C. JENKINS, OSWEGO, N. Y.**



—THE—  
**Timby Burglar-Proof**  
**SASH LOCK**  
AND  
**VENTILATOR.**

One Lock only required for a Window. It locks either or both sash securely in any position desired, thereby affording the means of Perfect Ventilation; also absolute security against Burglars and Sneak-Thieves.

Its simplicity, automatic action, strength, ventilating qualities, and adaptability to varying thicknesses of sash or inside stops, render it more desirable than any other Sash Lock now offered in the market.

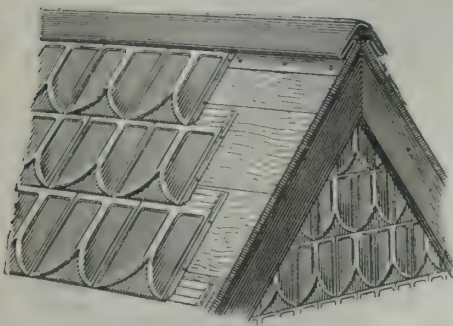
Manufactured from the Best Malleable Iron, Steel, Brass and Bronze Metal.

**Jenkins & Timby,**  
Manufacturers,  
OSWEGO, N. Y.



# THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.



Our Gothic Shingle and Plain Ridge Coping.

## TILES.

**NEW PRINCIPLE.** Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

## SHINGLES.

**Gothic Pattern.** The BEST SHINGLE ever offered to the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

Illustrated Catalogue mailed to any address an application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.



Shield Tiles as laid on roof with Roll Ridge Coping.

## SEALED PROPOSALS.

August 17, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 18th day of September, 1888, for the labor and materials required in the erection and completion of the U. S. Custom House and Post Office, at New Bedford, Mass.; including interior finish, plumbing and gas fitting, approaches, etc., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Association, Boston, Mass.; Master Builders' Exchange, Albany, N. Y.; Builders' Association, Brockton, Mass.; Builders' and Traders' Exchange, Chicago, Ill.; Builders' Exchange, Lynn, Mass.; Mechanics' Exchange, Worcester, Mass.; Mechanics' and Traders' Exchange, New York, N. Y.; and the Engineers' Society of Western Pennsylvania, Pittsburgh, Pa. Each bid must be accompanied by a certified check for \$500. Upon receipt at this office of a post office money order, in amount \$5.00, drawn to the order of the Treasurer of the United States, parties will be furnished with copies of specification and drawings. WILL. A. FRERET, Supervising Architect.

August 17, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 15th day of September, 1888, for the labor and materials required in the erection and completion of the entire building above pile foundation, including interior finish and gas fitting, etc., for the U. S. Court House and Post Office, at Key West, Florida, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges in Baltimore, Md., Cincinnati, O., and Charleston, S. C.; the Builders' and Traders' Exchange, Louisville, Ky.; the Mechanics' Exchange, Chicago, Ill.; the Knights of Labor, Concord, N. H.; the Mechanics' and Traders' Exchange, New York, N. Y.; the Mechanics' Exchange, Worcester, Mass., and the Builders' Exchange, Baltimore, Md. Each bid must be accompanied by a certified check for \$500. WILL. A. FRERET, Supervising Architect.

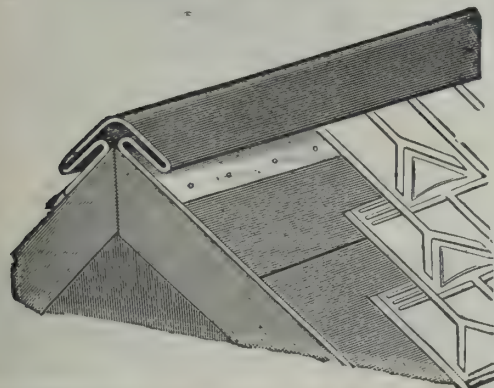
August 25, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 26th day of September, 1888, for the labor and materials required in the completion of the interior finish of the U. S. Court House and Post Office, etc., building at Augusta, Maine, including plumbing, gas fitting, etc., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Master Builders' Exchanges at Albany, N. Y., and New Haven, Conn.; the Master Builders' Association, Boston, Mass.; the Builders' and Traders' Exchange, Chicago, Ill.; the Knights of Labor, Concord, N. H.; the Mechanics' and Traders' Exchange, New York, N. Y.; the Mechanics' Exchange, Worcester, Mass., and the Builders' Exchange, Baltimore, Md. Each bid must be accompanied by a certified check for \$500. WILL. A. FRERET, Supervising Architect.

August 22, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 26th day of September, 1888, for the labor and materials required in the erection and completion of the U. S. Court House, Post Office, etc., building at Abingdon, Va., except heating apparatus, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, Builders' Exchanges at Baltimore, Md., and Cincinnati, Ohio; Builders' and Traders' Exchange at Charleston, S. C.; Builders' and Traders' Exchange at Louisville, Ky.; Virginia Mechanics' Institute at Richmond, Va., and with the Custodians of the U. S. Court House, etc., buildings at Atlanta, Ga., Knoxville, Tenn., and Lynchburg, Va. Each bid must be accompanied by a certified check for \$500. The Supervising Architect, Treasury Department, will furnish copies of the specification and drawings at \$5.00 a set, upon receipt of that sum, in post office money order, drawn to the order of the Treasurer of the United States. WILL. A. FRERET, Supervising Architect.

## Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

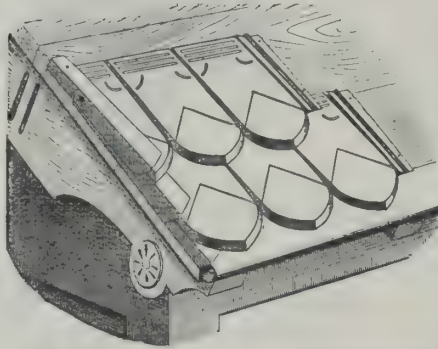
A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Walter's Patent Standard Metallic Shingles.

## WHOLESALE AGENTS.

W. W. MONTAGUE & Co., San Francisco, Cal., Pacific Coast.  
PHILLIPS & BUTTORFF MFG. Co., Nashville, Tenn.  
MCDONALD, KEMP & Co., Toronto, Sole Agents, Canada.  
KNISELY & MILLER, Chicago, Ill.  
J. J. WALTERS, Denver, Col.  
JEROME TWICHELL & Co., Kansas City, Mo.



Cooper's Patent Queen Anne Metallic Shingles.



THE NATIONAL SHEET METAL ROOFING CO.,  
510, 512, 514, 516, 518 & 520 East 20th St., New York.

## MARSTON'S IMPROVED Hand and Foot Power Band Saw.

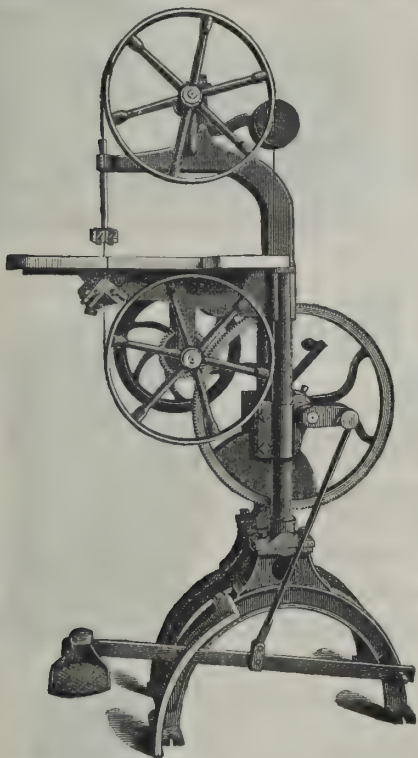


Table is 3 feet 6 inches from floor; measure 18 x 21 inches; is adjustable for cutting on a bevel Guide for saw both above and below table. Distance from table to guide when raised its full height, 5 inches; 16 inches between saw and frame. All gears cut from solid iron. Shafts are made of steel. Saw pulleys covered with rubber. Upper saw pulley has adjustment to bring it into line with lower saw pulley. Weight of machine, 260 lbs. Machines on trial.

J. M. MARSTON & CO.,  
Cor. Appleton & Tremont Sts.,  
Boston, Mass.

## PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-one years experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,  
361 Broadway, New York.

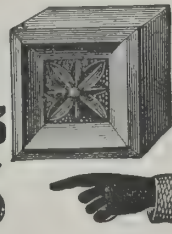
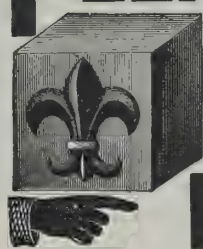
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

## PEERLESS BRICK CO.

PHILADELPHIA, PA.

1003 WALNUT ST.

WORKS—70 Acres—Old York Road and Nicetown Lane.



PLAIN, PRESSED FRONT, ORNAMENTAL & MOLDED  
**BRICKS**

MADE OF

**THOROUGHLY TEMPERED CLAY.**

16,000,000 Bricks Annually.

5,000,000 PRESSED FRONT BRICKS,

QUALITY and FINISH  
UNEQUALED.

**600 DIFFERENT DESIGNS AND SHAPES.**

VARIOUS SIZES, COLORS, AND SHADES.

Red, Buff, Drab, Brown, Gray,  
Black, White and Pompeian.



Orders filled for large quantities of PRESSED FRONT or FACE BRICKS of any one shade.  
**BRICK FIRE PLACES and MANTELS.**  
ARCHES of all kinds ground and fitted from drawings furnished to us. Full size working plans sent with bricks.  
**SPECIAL SHAPES** made from designs furnished us by Architects. Bricks shipped in cars at our works for all parts of the country. Illustrated Catalogue and Price List sent on application.



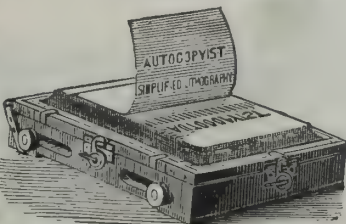
The Latest Out.

## THE .: IMPROVED .: AUTOCOPYIST.

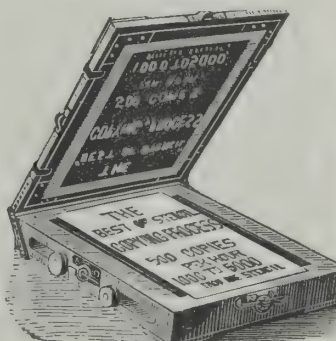
Patented in U. S. A. 15 Prize Medals.

## A UNIVERSAL COPYING APPARATUS

ADAPTED TO EVERY VARIETY OF COPYING.  
It is throughout the MOST PERFECT APPARATUS ever placed in the market for duplicating



Autograph  
AND  
Type-Writer  
Work,  
Architectural  
AND  
Mechanical  
Drawings



Up to the largest size, and in several colors at one impression.

It Combines the BEAUTIFUL ART OF LITHOGRAPHY and the BEST STENCIL PROCESS.

Chief Office of Improved Autocopyist, 151 Monroe St., Chicago, Ill.

## ARCHITECTURE.

An Encyclopædia of COTTAGE, FARM, and VILLAGE ARCHITECTURE and FURNITURE, containing numerous Designs for Dwellings, from the Villa to the Cottage and the Farm, including Farm Houses, Farmhouses, and other Agricultural Buildings, Country Inns, Public Houses, Parochial Schools; with the requisite Fittings Up, Fixtures, and Furniture, and appropriate Offices, Gardens, and Garden Scenery. By J. C. LOUDON, F.L.S., H.S., G.S., Z.S. Illustrated by more than 2,000 engravings, over 1,300 pages. Sent by mail or express on receipt of \$5.00.

MUNN & CO., 361 Broadway, New York.

## MANAHAN'S PARCHMENT SHEATHING

Strongest, Lightest, most Waterproof.

One Dollar's worth covers more ground than same amount of most sheathing. Send for Samples.

HALLETT BROS., Sole Agents,  
290 Devonshire St., BOSTON.

## THE ANDERSON

PRESSED FACE, SHAPE

AND ORNAMENTAL

## BRICK,

in Red, Buff, Brown, Drab, Old Gold, Obsidian, Pink, Black, White, Garnet, Blood Stone, Onyx, Mottled, Drused, Marbled, Roman, Ashlar, etc., are pronounced by Architects, in strength, texture, uniformity of size, color, shades, perfect shape, angles, and lines, the finest in the world, surpassing everything in the art.

## THE ANDERSON COMPANIES

are the largest manufacturers in fine grades of PRESSED BRICK in this country or abroad.

Architects and Builders can obtain illustrated catalogue and any desired information, on application to the nearest Company.

CHICAGO ANDERSON PRESSED BRICK CO., Office, 189-191 La Salle St., Chicago.

NEW YORK ANDERSON PRESSED BRICK CO., Office, 132 Mauglin St., New York.

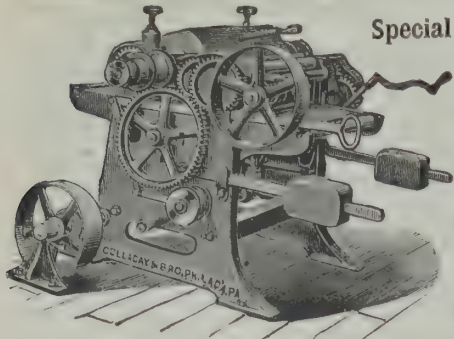
NEW ENGLAND ANDERSON PRESSED BRICK CO., Office, 50 Bromfield St., Boston.

## WOOD FLOORS

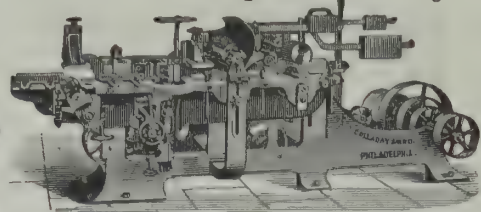
BOUGHTON & TERWILLIGER

231 STREET FIFTH AVE. HOTEL



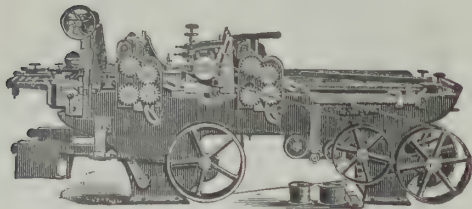


Special Wood Working Machinery

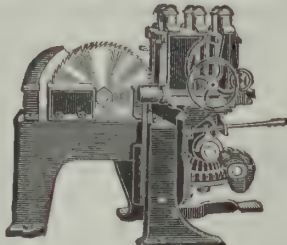


For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc.  
Manuf'd by **Joseph O. Colladay & Bro.,**  
Nicholson & Race Street, Philadelphia.

Woodworking Machinery, Planers and Matchers, Pony Planers, Hand Matchers, Solid Plate and Segment Re-Saws.

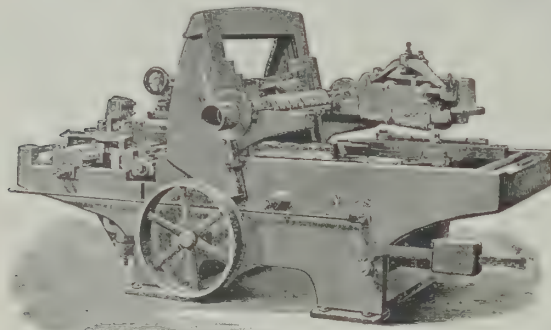


PLANER AND MATCHER.



SIDING SAW.

**CONNELL & DENCLER, Rochester, New York.**



**HOYT & BROTHER CO.**  
AURORA, ILL.

MANUFACTURERS OF  
Machinery for Working Wood.

Planing Mill Machinery  
a Specialty.

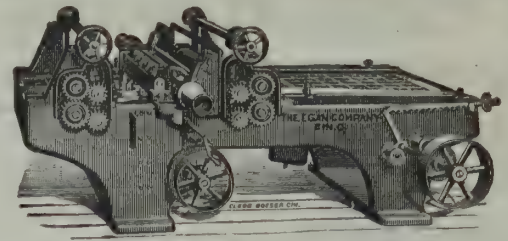
Send for Catalogue.

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,

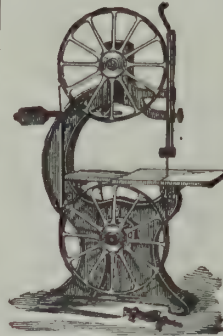
**MUNN & CO., 361 Broadway, New York.**

E  
F  
F  
I  
C  
I  
E  
N  
T



No. 3 Planer and Matcher.

D  
U  
R  
A  
B  
L  
E



No. 2 Band Saw.

**THE EGAN COMPANY,**

BUILDERS OF  
Woodworking Machinery

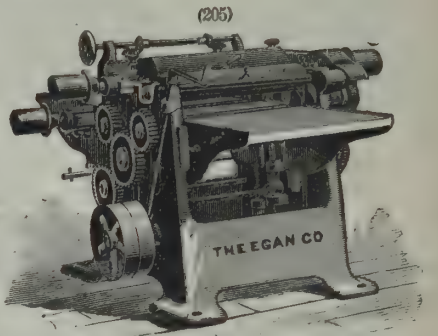
For Builders, Carpenters, Planing Mills, and General Woodworkers.

209 to 229 W. Front St.

Cincinnati, Ohio, U. S. A.

Complete Outfits Furnished.

Write for Catalogue & Prices



No. 2 1/2 Double Cylinder Planer.  
Planes 26 inches wide and 6 inches thick.



**CUTTING & DE LANEY,**  
Buffalo, N. Y.,

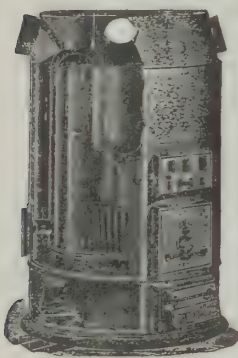
ARTISTIC  
Wood Workers.

East Indian, Japanese, and Moorish

Decorative Lattice.  
Special Designs To Order.

FINE CARVED  
Furniture.

Price of Border Ceiling  
of Decorative Lattice.



"Alsop" Warm-Air and Combination Warm-Air and Steam Furnace

THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

IN OFFERING this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a new departure in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

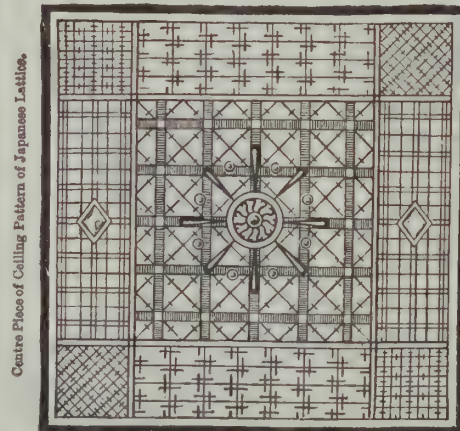
This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation.  
Manufactured by the **ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.**



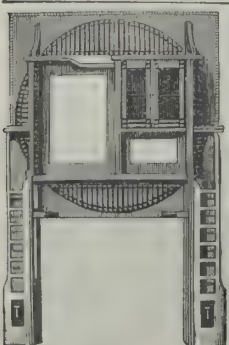
**MANAHAN'S**  
Waterproof Parchment,  
Strongest and Lightest Sheathing.

One Dollar's worth covers more ground than same amount of most sheathing. Send for Samples.

**HALLETT BROS., Sole Agents,**  
290 Devonshire St., BOSTON.



Centre Piece of Ceiling Pattern of Japanese Lattice.



**Mankey Decorative Company,**

Incorporated Sept. 9, 1885.

**Williamsport, Pa.,**

CAPITAL \$100,000.

—MANUFACTURERS OF—

Artistic Wood Decorations for Public and Private Buildings

MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

WOOD MANTELS and DOORS A SPECIALTY.

ART STAINED GLASS

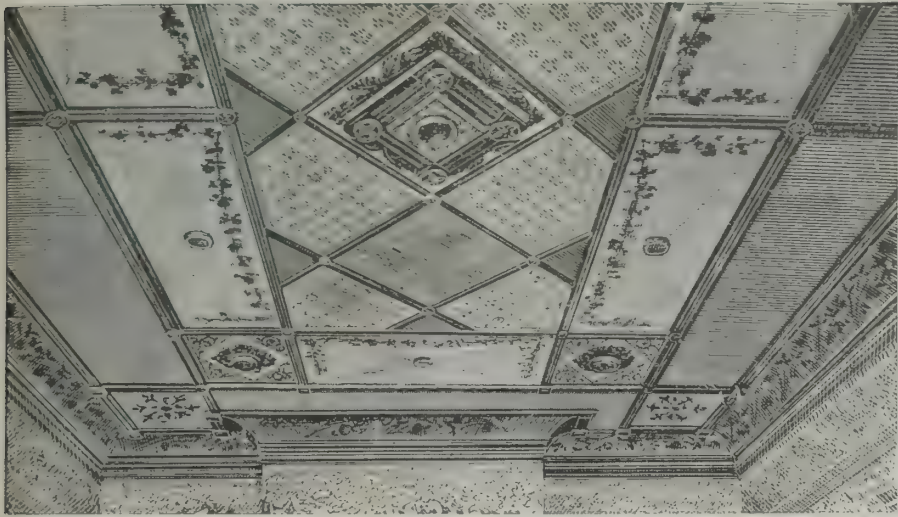
FOR CHURCHES, DWELLINGS, Etc.

Keystone Stained Glass Works,

271 SOUTH 5th ST., PHILADELPHIA.



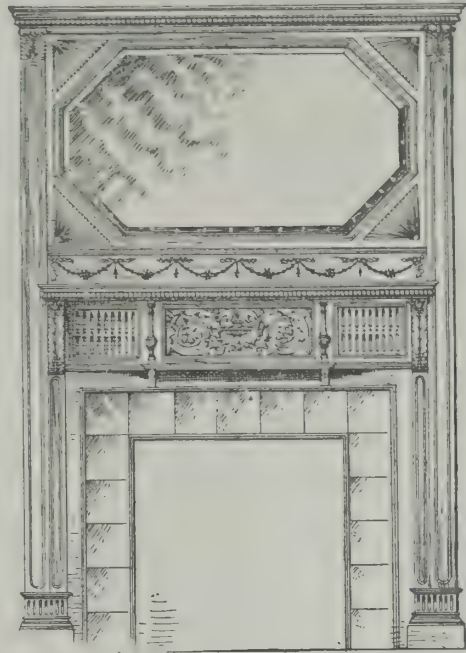
NORTHROP'S PATENT paneled iron ceiling.



Far surpassing either plaster or wood ceilings. These ceilings can be laid over old broken plaster as well as on new work. These ceilings are covered by 6 original patents.

Send for Illustrated Circulars and Price Lists.

A. NORTHROP & CO. Sole Manufacturers, PITTSBURGH, PA.



KEELER & CO.,  
WOOD MANTELS  
—AND—  
FURNITURE,

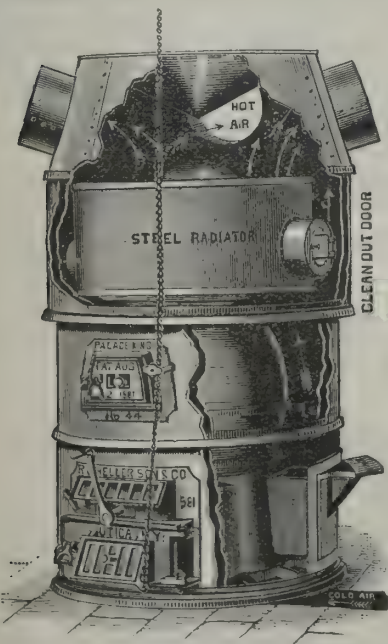
Made from our own or architect's drawings.

81-91 Washington St.,

Cor. Elm, Boston, Mass.

Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

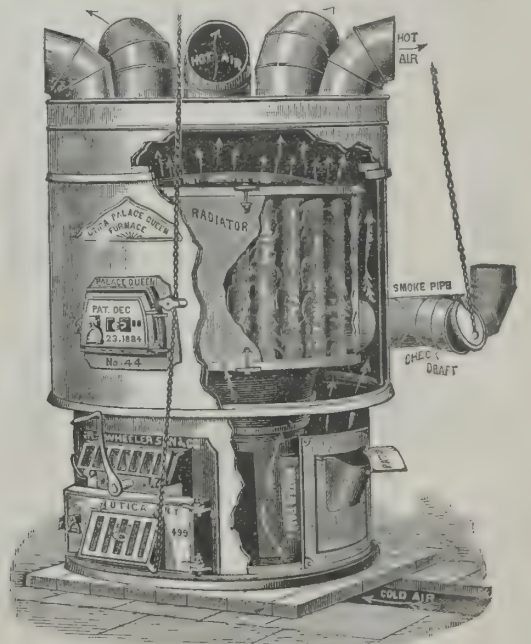
<b>Adjustable Planes.</b> Stanley Rule & Level Co.....cover ii	<b>Brass Goods.</b> C. H. Besly & Co.....ii	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot.....xiv	<b>Foot and Hand Power Machinery.</b> Page W. F. & J. Barnes Co.....ii
<b>Advertising Glass Signs.</b> The Western Sand Blast Co.....iii	<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.).....cover iii	<b>Cutter Heads.</b> Sam'l J. Shimer.....iv	C. E. Little.....ii
<b>Annunciators.</b> Partrick & Carter.....vii	<b>Brick.</b> Chicago Anderson Pressed Brick Co.....xi Peerless Brick Co.....xi	<b>Decorative Lattice.</b> Cutting & De Laney.....xii	J. M. Marston & Co.....xi
<b>Architects' and Surveyors' Supplies.</b> L. Manasse.....iv	<b>Brick Machinery.</b> Henry Martin.....v	<b>Door Knobs.</b> Dibble Mfg. Co.....viii	Sebastian May & Co.....vi
<b>Architects.</b> C. Powell Karr, C.E.....iv Smith, F. L.....iii	<b>Builders' Hardware.</b> C. A. Strelinger & Co.....vii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co.....xii E. P. Wilce & Co.....cover iii	<b>Furnaces.</b> Abram Cox Stove Co.....cover iii
<b>Architectural Wood Turning.</b> Anderson & Dickey.....iv Standard Wood Turning Co.....iv	<b>Builders' Scroll Saw.</b> W. F. & J. Barnes Co.....ii	<b>Door Hangers.</b> Lane Bros.....vii	Barstow Stove Co.....viii
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.).....cover iii	<b>Building Paper, Felt, Etc.</b> M. Ehret, Jr., & Co.....cover iv Warren-Ehret Co.....cover iii H. F. Watson.....cover vii	<b>Drawing Instruments, Etc.</b> G. S. Woolman.....iv L. Manasse.....iv	Boynton Furnace Co.....viii
<b>Artistic Wood Decorations.</b> Buffalo Novelty Wood Turning Co.....xii Cutting & De Laney.....xii Keeler & Co.....xiii Mankey Decorative Co.....xii E. P. Wilce & Co.....cover iii	<b>Cables.</b> Standard Underground Cable Co.....i	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co.....ii	Alsop Furnace and Stove Co.....xii
<b>Artists' Materials.</b> A. H. Abbott & Co.....cover iii F. W. Devoe & Co.....i	<b>Carbolate of Lime.</b> M. Ehret, Jr., & Co.....cover v	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co.....v Jas. L. Haven Co.....cover iii M. B. Swezey.....ii	Carton Furnace Co.....ix
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr., & Co.....cover iv Warren Chemical and Mfg. Co.....vii	<b>Carpenters' Tools.</b> Stanley Rule and Level Co.....cover ii Strelinger, C. A. & Co.....vii	<b>Eaves Trough and Gutters.</b> Hatten, Galpin & Co.....ix	E. A. Jackson & Bro.....cover ii
<b>Asbestos.</b> H. W. Johns Mfg. Co.....v H. F. Watson.....cover iii	<b>Carpet Lining.</b> Warren-Ehret Co.....cover iii H. F. Watson.....cover iii	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co.....i	Leibrandt & McDowell Stove Co.....i
<b>Auger Bits.</b> Bridgeport Gun Implement Co.....ii	<b>Cements.</b> H. W. Johns Mfg. Co.....v M. Ehret, Jr., & Co.....cover iv	<b>Electric Lights.</b> The Thomson-Houston Electric Co.....cover iii	Omega Grate Co.....iv
<b>Automatic Air Valves.</b> Thos. L. McKeen.....ii	<b>Chandeliers.</b> I. P. Frink.....ii	<b>Electrical Supplies.</b> Partrick & Carter.....vii Shaw & Geary.....cover iv	J. F. Pease Furnace Co.....i
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co.....iv Anderson & Dickey.....iv	<b>Combination Dividers.</b> L. S. Starrett.....vii	<b>Elevators.</b> L. S. Graves & Co.....v Jas. L. Haven Co.....cover iii Henry H. Hill.....ii Howard Iron Works.....v Morse, Williams & Co.....ii	J. Reynolds & Son.....ix
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts.....iii	<b>Contractor and Builder.</b> Allen B. Rorke.....iv	<b>Engineers' Supplies.</b> L. Manasse.....iv	Richardson & Boynton Co.....viii
<b>Bent and Beveled Glass.</b> Vanhorne, Griffin & Co.....i	<b>Copying Apparatus.</b> Improved Autocopyist.....xi	<b>Feed Water Heaters.</b> Stewart Heater Co.....cover ii	Schoen Heater and Stove Co.....ix
<b>Bicycles.</b> A. W. Gump & Co.....cover iii	<b>Cordage.</b> J. P. Tolman & Co.....cover ii	<b>Fire Brick.</b> Henry Maurer & Son.....iii	R. Wheeler, Son & Co.....xiii
<b>Black Varnish.</b> M. Ehret, Jr., & Co.....cover iv	<b>Corrugated Iron Lath.</b> The Cincinnati Corrugating Co.....ii Canton Iron Roofing Co.....iv N. S. Northrop.....ii A. Northrop & Co.....xiii Sykes Iron Roofing Co.....iv	<b>Fireproof Building Materials.</b> Henry Maurer & Son.....iii	The Simonds Mfg. Co.....ix
<b>Boiler Coverings.</b> M. Ehret, Jr., & Co.....cover iv Shields & Brown.....iii H. W. Johns Mfg. Co.....v	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr., & Co.....cover iv H. W. Johns Mfg. Co.....v Shields & Brown.....iii Western Mineral Wool Co.....v	<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co.....xi Canton Iron Roofing Co.....iv	
<b>Booksellers and Publishers.</b> Houghton, Mifflin & Co.....vi J. B. Lippincott & Co.....vi Ticknor & Co.....vi John Wiley & Sons.....vi		<b>Fireproofing Material.</b> H. W. Johns Mfg. Co.....v H. F. Watson.....cover iii	



PALACE KING  
—AND—  
PALACE QUEEN  
WARM AIR FURNACES.

SEND FOR CATALOGUE.

RUSSEL WHEELER, SON & COMPANY,  
UTICA, N. Y.

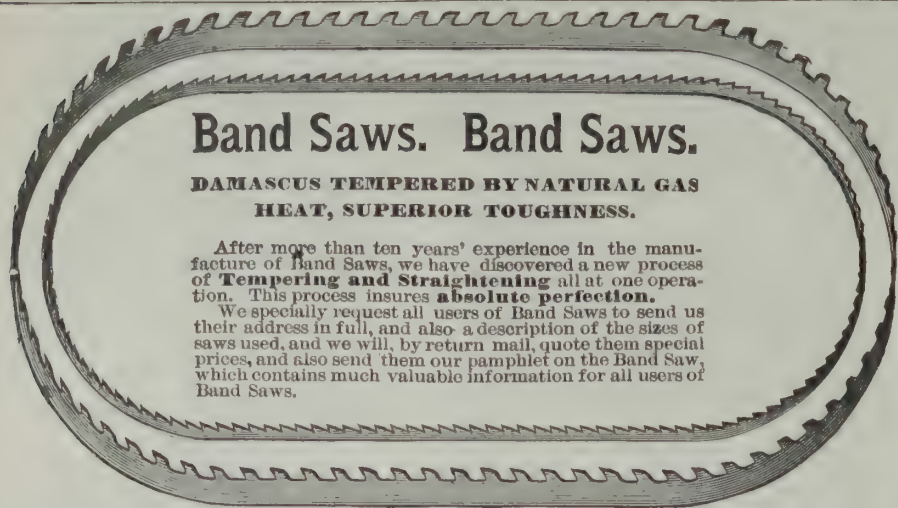


CHILTON PAINTS.

The Chilton Manuf. Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application.

147 Fulton St., New York.  
141 Milk Street, Boston.





The Superior Quality of our Band Saws, All Tempered, Straightened, and Trued at one operation, which we have patented, makes them so perfect that our SALES HAVE MORE THAN TREBLED IN THE PAST YEAR. Our largest and best customers prefer them to the best imported saws.

WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.

NATURAL GAS

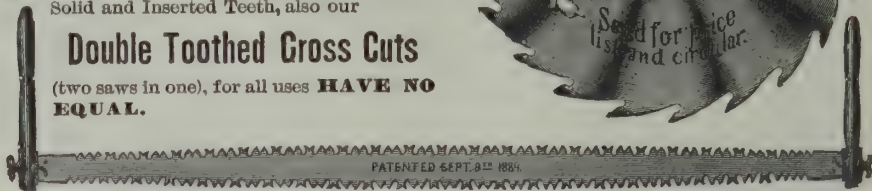
Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

OUR CIRCULAR SAW

Of all sizes from 6 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

Double Toothed Cross Cuts

(two saws in one), for all uses HAVE NO EQUAL.



Our SAWYER'S HANDBOOK will be sent FREE to any part of the world on receipt of full name and address.

Address EMERSON, SMITH & CO. (LIMITED), Beaver Falls, Pa.

CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

<b>Heating Apparatus.</b> Abram Cox Stove Co. .... cover iii Alsop Furnace and Stove Co. .... xii Barstow Stove Co. .... viii B. C. Bibb Stove Co. .... ix Boynton Furnace Co. .... viii Broomell & Sanks. .... x Carton Furnace Co. .... ix Danforth & Clark. .... cover iii Duplex Steam Heater Co. .... i Globe Steam Heater Co. .... viii Gurney Hot-Water Heater Co. .... ii Hitchings & Co. .... cover ii E. A. Jackson & Bro. .... cover ii Leibbrandt & McDowell Stove Co. .... i National Hot Water Heater Co. .... viii New York Central Iron Works. .... cover iii Omega Grate Co. .... iv J. F. Pease Furnace Co. .... i Pierce, Butler & Pierce. .... cover iv J. Reynolds & Son. .... ix Richardson & Boynton Co. .... viii Schoen Heater and Stove Co. .... ix Silsby Mfg. Co. .... ix The Simonds Mfg. Co. .... ix B. F. Sturtevant. .... viii Weston Engine Co. .... cover iv R. Wheeler, Son & Co. .... xiii Woodcock & Co. .... viii	<b>Office and Bank Fittings.</b> A. H. Andrews & Co. .... iii	<b>Oil Well Supplies.</b> Oil Well Supply Co. .... iii	<b>Ornamental Brick.</b> Chicago Anderson Pressed Brick Co. .... xi Peerless Brick Co. .... xi	<b>Ornamental Glass Work.</b> C. H. Postel & Co. .... cover iv The Western Sand Blast Co. .... iii	<b>Ornamental Rustic Work.</b> John Wheeler. .... iv	<b>Paints.</b> The Chilton Mfg. Co. .... xiii F. W. Devoe & Co. .... i S. H. French & Co. .... iii H. W. Johns Mfg. Co. .... v Prince Mfg. Co. .... cover iii The Standard Paint Co. .... cover iv	<b>Paneled Sheet Iron Ceiling.</b> H. S. Northrop. .... ii	<b>Parchment Sheathing.</b> Hallett Bros. .... xi	<b>Parquet Floors.</b> J. Dunfee & Co. .... vii	<b>Patents.</b> Munn & Co. .... xi	<b>Pattern Makers' and Carvers' Tools.</b> C. A. Strelinger & Co. .... vii	<b>Photographic Outfits.</b> E. & H. T. Anthony & Co. .... ii	<b>Planing Mill Machinery.</b> Hoyt & Bro. Mfg. Co. .... xii	<b>Polished Plate Glass.</b> Pittsburgh Plate Glass Co. .... x P. Semmer Glass Co. .... vii Vanhorne, Griffin & Co. .... i	<b>Porous Terra Cotta.</b> Henry Maurer & Son. .... iii	<b>Porous Earthenware.</b> Henry Maurer & Son. .... iii	<b>Portland Cement.</b> Howard Fleming. .... v Lesley & Trinkle. .... cover iv	<b>Poultry Yard Appliances.</b> S. S. Bent & Son. .... iv	<b>Prepared Roofing.</b> M. Ehret, Jr., & Co. .... cover iv H. F. Watson. .... cover iii	<b>Pressed Brick.</b> Chicago Anderson Pressed Brick Co. .... xi	<b>Pumping Engines.</b> Economic Gas Engine Co. .... cover ii	<b>Recording Thermometer.</b> The Draper Mfg. Co. .... iv	<b>Reflectors.</b> I. P. Frink. .... ii	<b>Roof Snow Guards.</b> John H. Hiller. .... cover ii	<b>Roofing Paper, Etc.</b> M. Ehret, Jr., & Co. .... cover iv H. W. Johns Mfg. Co. .... v The Standard Paint Co. .... cover iv Warren-Ehret Co. .... cover iii Warren Chemical & Mfg. Co. .... vii H. F. Watson. .... cover iii	<b>Roofing Slate.</b> E. J. Johnson. .... vi The Old Bangor Slate Co. .... vi	<b>Roofing Tin.</b> Gumme, Sperring & Co. .... cover iv N. & G. Taylor Co. .... cover iv	<b>Roofing and Wall Tiles.</b> Canton Iron Roofing Co. .... iv Cortright Metal Roofing Co. .... xi The National Sheet-Metal Roofing Co. .... xi The Standard Paint Co. .... cover iv Thorn Shingle and Ornament Co. .... iii	<b>Rustless Iron Water Pipe.</b> The Wells Rustless Iron Co. .... v	<b>Sand Blast and Embossed Railroad Glass.</b> The Western Sand Blast Co. .... iii	<b>Sash Cord.</b> J. P. Tolman & Co. .... cover ii	<b>Sash Lock.</b> Jenkins & Timby. .... x The Champion Safety Lock Co. .... xi The Clatten Mfg. Co. .... vii	<b>Saws.</b> Emerson, Smith & Co. .... xiv Seneca Falls Mfg. Co. .... ii	<b>Scroll Saws and Tools.</b> W. F. & J. Barnes Co. .... ii Seneca Falls Mfg. Co. .... ii	<b>Shade Roller.</b> Cushman Bros. & Co. .... ii	<b>Shaking Grate.</b> Woodcock & Co. .... viii	<b>Sheathing Lath.</b> I. G. Jenkins. .... x	<b>Shingle Stains.</b> Sam'l Cabot. .... xiv Dexter Bros. .... i	<b>Shutter Worker.</b> F. B. Mallory. .... iii	<b>Skylights.</b> G. Hayes. .... iv	<b>Slate Roofers' Supplies.</b> E. J. Johnson. .... vi	<b>Sliding Blinds.</b> Hartman & Durstine. .... x Wm. Willer. .... x	<b>Stable Fittings and Fixtures.</b> S. S. Bent & Son. .... iv	<b>Steam Hot Blast Apparatus.</b> B. F. Sturtevant. ....	<b>Steam &amp; Hot Water Heating Engineers.</b> Danforth & Clark. .... cover iii	<b>Tools and Machinery for Oil Wells.</b> Oil Well Supply Co. .... iii	<b>Tools and Foot Power Machinery.</b> C. E. Little. .... ii Seneca Falls Mfg. Co. .... ii	<b>Tower Ornaments, Finials, Etc.</b> Thos. W. Jones. .... vi	<b>Underground Cable.</b> Standard Underground Cable Co. .... i	<b>Valves and Fire Hydrants.</b> Mason Regulator Co. .... cover ii Mellert Foundry & Machine Co. .... cover iii Pancoast & Rogers. .... viii	<b>Varnish.</b> F. W. Devoe & Co. .... i Standard Varnish Works. .... iii	<b>Ventilating and Exhaust Fans.</b> Geo. P. Clark. .... vi The Simonds Mfg. Co. .... cover iv	<b>Wall Plaster.</b> Adamant Mfg. Co. .... vii	<b>Water Heaters.</b> Instantaneous Water Heater Co. .... iv	<b>Water Motors.</b> Backus Water Motor Co. .... vii	<b>Water Pressure Regulators.</b> H. Mueller & Sons. .... iv	<b>Waterproof Parchment.</b> Hallett Bros. .... xii	<b>Weather Strips.</b> J. Dunfee & Co. .... vii Richmond Weather Strip Co. .... ix	<b>Weather Vanes.</b> Thos. W. Jones. .... vi	<b>Window Guards and Gates.</b> Composite Iron Works. .... cover ii	<b>Window Sash Cord.</b> J. P. Tolman & Co. .... cover ii	<b>Wood Carpet.</b> J. Dunfee & Co. .... vii	<b>Wood Finishes.</b> Bridgeport Wood Finishing Co. .... x F. W. Devoe & Co. .... i Murphy & Co. .... i D. Rosenberg & Sons. .... iii	<b>Wood Floors.</b> Boughton & Terwilliger. .... xii	<b>Wood Mantels.</b> Keeler & Co. .... xiii Mankey Decorative Co. .... xii	<b>Woodworking Machinery.</b> F. H. Clement. .... x J. O. Colladay & Co. .... xii Connell & Dengler. .... xii The Egan Co. .... xii E. & F. Gleason. .... cover iv Hoyt & Brother Co. .... xii C. B. Rogers & Co. .... iv Samuel J. Shimer. .... iv	<b>Wrought Iron and Cement Lined Pipe.</b> Penna. Pipe Mfg. Co. .... cover iv
---	--	---	--	--	---	--	---	--	--	---------------------------------------	---	--	---	---	--	--	--	--	--	---	--	--	--	---	---	---	--	---	--	---	---	---	--	---	---	---	---	--	---	--	---	--	---	---	---	---	--	--	--	---	---	--	---	---	---	---	--	--	--	--	--	---	---	---	--	---	--

A VALUABLE BOOK  
ON PHYSICAL CULTURE  
FREE  
ON APPLICATION.

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

NARRAGANSETT MACHINE CO.,  
55 Sprague Street, Providence, R. I.

HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH  
CABOT'S CREOSOTE STAINS.



These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 30c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. Send for Samples on Wood, and Circulars.  
SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.



The Thomson-Houston Electric Co.

—MANUFACTURE—

THE ONLY PERFECT AUTOMATIC SYSTEM OF

# ARC AND INCANDESCENT LIGHTING

In the World.

New illustrated pamphlet will be furnished on application.

THE THOMSON-HOUSTON ELECTRIC COMPANY,

Principal Offices: 178 Devonshire St., BOSTON.

Western Offices: Pullman Building, CHICAGO.



## PRINCE'S METALLIC PAINT

An Indestructible Coating for

Iron, Tin and Wood.

Will cover twice the surface at less than half the cost of lead.

But one color made, "Brown." Send for circular, to the sole manufacturers,

PRINCE MANUFACTURING CO.,

71 Maiden Lane, New York.

E. P. WILCE & CO.,

MANUFACTURERS OF

## DOORS, SASH AND BLINDS

FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

Stair Work and Interior Finish, Mantels, Sideboards, Pulpits, Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets,

CHICAGO.

## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

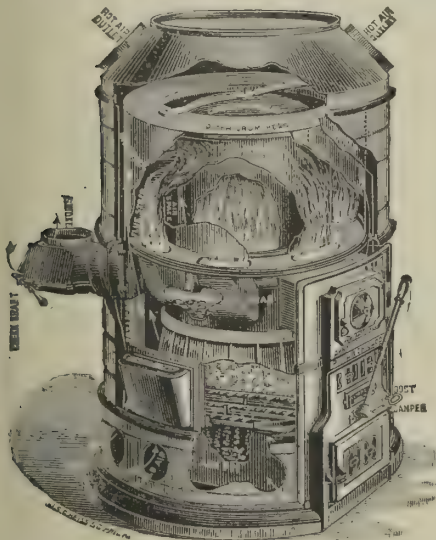
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



SOMETHING NEW:

### Model Novelty Range.

Economy in Space, Fuel, and Labor.

No Brick Jambs or Lintel or Boiler Stand.

Horizontal Hot Water Boiler on Top of Range.

HOT AIR ATTACHMENT.

MANY OTHER FEATURES.

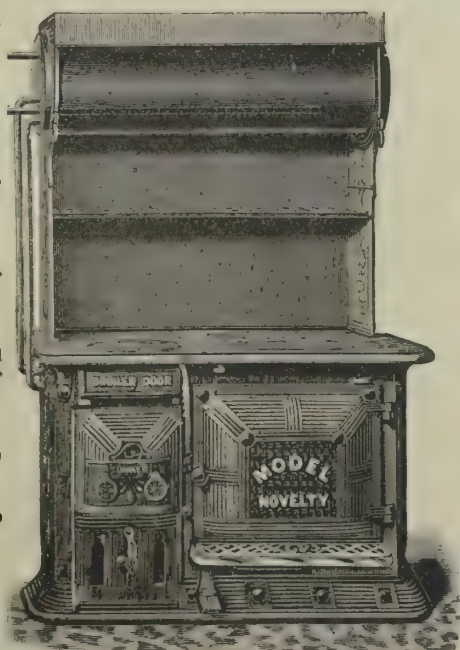
Architects, Builders, and Owners should see and call for the above Specialties for Dwellings or Apartment Houses.

ABRAM COX STOVE CO., PHILADELPHIA and CHICAGO,

EXPERTS AND SPECIALISTS IN HOT AIR AND RANGE SUPPLIES.

NEW YORK AGENCY:

WILKINSON & BANTA, 250 WATER STREET.



## ART STAINED GLASS

For Churches & Dwellings

Antique and Mosaic Work. Designs and Estimates on application.

William Reith,

134 N. 7th St., Philadelphia, Pa.



Cast Iron Pipe for Structural Work, Columns, etc.

Flange Pipe and Specials.

STOP VALVES, FIRE HYDRANTS, LAMP POSTS.

MELLERT FOUNDRY & MACHINE CO., Limited, READING, PA.

## Art \* Metal Work

BRASS LAMPS FOR CHURCHES. BRASS WORK FOR CHURCH ALTARS. BRONZE GRILLES FOR DOORS. WINDOW RAILINGS. ORNAMENTAL LANTERNS. BRASS RAILINGS FOR BANKS. METAL SIGNS.

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

## STAINED GLASS

MEMORIAL, CHURCH, AND DOMESTIC WORK.

C. H. POSTEL & CO.,

1314 RIDGE AVE., PHILADELPHIA.

Branch Office, 527 Arch Street.



Manufacturer of Ecclesiastic and Domestic

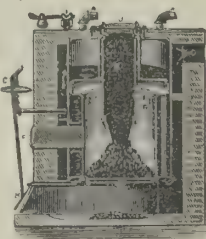
## ART STAINED GLASS,

F. J. RIESTER, Prop'r, Buffalo, N. Y.

### The Dunning Patent Wrought Iron Boiler. (Over 13,500 in use)



THE Dunning Boiler, Self-Feeding, is the best for Low Pressure Steam Heating, and insures a warm house night and day. Free from Carbonic Acid Gas and Smoke. Made in eleven sizes, suitable to heat the smallest Cottage to the Largest Business Block, in five different styles: As a Magazine Boiler, which requires attention but once in twenty-four hours. As a Surface Burning Boiler, which will burn Hard or Soft Coal, Wood, Coke or Gas. As a Hot Water Boiler, for Green House and hot water heating. As a Portable Boiler, to be set without brickwork. Also in Two Sections, to pass through any door or window, where whole one cannot enter. Steam Engines and Boilers of all kinds and machinery generally. Manufactured at the New York Central Iron Works, Geneva, N. Y., U.S.A. LOCK BOX 40. Send for New Illustrated Catalogue.



Trade Mark.

## STEAM and HOT WATER HEATING ENGINEERS

Correspondence Solicited.

Danforth & Clark, Buffalo, N. Y.



WE SELL ALL AMERICAN

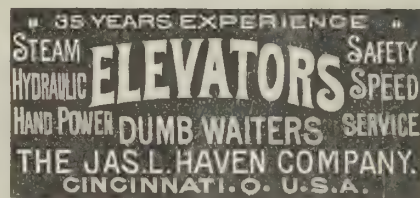
### BICYCLES.

And guarantee LOWEST PRICES.

A. W. GUMP & CO., Dayton, O.

Largest retail stock in America.

52 in OTTO, factory price \$80.00, our price \$40.00.  
50 in. " " " 55.00, " " 35.00  
48 in. " " " 50.00, " " 33.00  
46 in. " " " 45.00, " " 30.00  
44 in. " " " 40.00, " " 27.00.  
Order quick. Also 250 second-hand Wheels. Repairing & Nickeling. Bicycles & Guns taken in trade

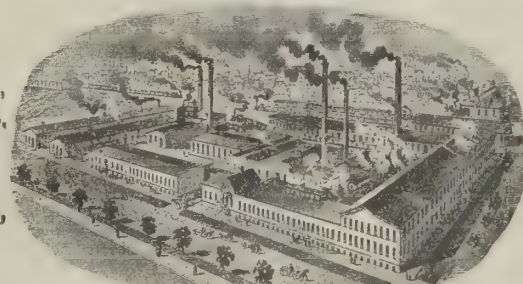


## KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

### BUILDING PAPERS.

ROSIN SIZED and WATERPROOF SHEATHINGS, DEADENING FELTS, PLAIN and CORRUGATED CARPET LININGS, ASBESTOS SHEATHINGS, Etc.



2 and 3 PLY PREPARED ROOFING, TARRED ROOFING FELTS, ROOFING MATERIALS, Etc., Etc. Send for Samples and Prices.

ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.

H. F. WATSON, MFR., ERIE, PA.

CHICAGO, ILL., NASHVILLE ROOFING & PAVING CO., LIBBY & WILLIAMS PAPER CO., Office, 86 Washington St. Nashville, Tenn. St. Louis, Mo.

## Warren-Ehret Co.,

—MANUFACTURERS OF—

## ROOFING

OF ALL KINDS.

### BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc. Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

—WORKS:—

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you  
get the quality and brand wanted?

Because every PERFECT SHEET of the  
following three extra fine guaranteed  
brands of Roofing TIN IS STAMPED at  
the works with the name of the brand and  
the thickness. Please note this.

"Old Style." Extra Heavily Coated.  
The Best Made.

"Westminster." Re-dipped. Made  
from Heavy Iron.

COCKLEY K Highest Grade of  
Heavy Regular Coated.

EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and  
full information given.

**N. & G. TAYLOR CO.**

Established 1810. 77th year.  
**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



PHILADELPHIA,  
423 Walnut Street.

ST. LOUIS,  
113 North 8th Street.

CHICAGO,  
50 Dearborn Street.

ANYBODY CAN PUT IT ON.  
EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY

**M. EHRET, Jr., & CO.,**

## THE "FLORIDA" HEATERS

TRADE MARK.

FOR STEAM HEATING.

16 Sizes—Magazine Feed for Hard Coal or Coke.  
16 Sizes—Surface Feed for Soft Coal, Wood or Gas.

For Hot Water Heating.

15 Sizes—Magazine or Surface Feed. Adapted to  
any fuel.

IN WARMING

**Suburban Homes**

The "Florida" has an established reputation. Its  
use insures uniform temperatures day and night.  
They are first-class in every respect, reliable, dur-  
able, and give best results in economical use of  
fuel, many thousands being in use. Descriptive  
book and references mailed free.

Address the Sole Manufacturers,

**Pierce, Butler & Pierce Mfg. Co.,**  
**SYRACUSE, N. Y.**

Estimates free. Satisfactory results guaranteed.



## YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,  
SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**IDEAL ROOFING,  
SHEATHING and INSULATING PAPERS.  
Electrical Compound, Farmers', Brewers',  
and Preservative Paints.**

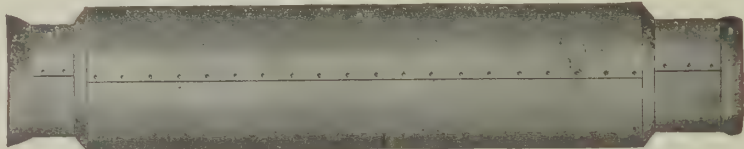


Please mention this paper

## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.



Pipe complete and ready for the trench.

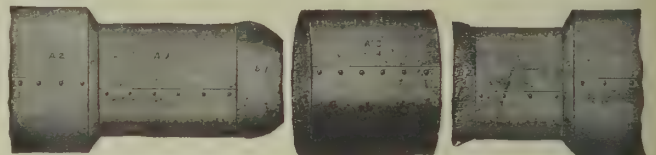
It is designed for

Public Works,

Public Buildings,

—AND—

Private Dwellings.



Wrought iron sleeve and the male and female ends before connecting for jointing.

MANUFACTURED BY THE

**PENNSYLVANIA PIPE MANUFACTURING CO.,**  
Germantown Junction, Philadelphia, Pa.

## Architects, Roofers, Builders. "Alderly" & "Pennsyl" Old Method Roofing Plate

THE TWO BEST BRANDS OF GUARANTEED ROOFING PLATES. NO BETTER PLATES MADE.

"ALDERLY," Made of Siemens-Martin Soft Steel. Only Perfectly Square Plate. Perfectly Sorted.

"PENNSYL," OLD METHOD TREBLE COATED ROOFING PLATE. Guaranteed to Stand Any Test. Heaviest Coated.

SEND FOR SAMPLE BOXES OF THESE CELEBRATED ROOFING PLATES.

SOLE MANUFACTURERS of the "PATTEN" METALLIC ROOFING SHINGLES. BEST MADE.

**GUMMEY, SPERING & CO.,**

Philadelphia—Liverpool.

## STAINED GLASS

For Churches and Private Dwellings, etc.

**JEWELLED MOSAICS.**

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WINDOW GLASS.

Malaga Glass & Mfg. Co.,

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

MALAGA AND MILLVILLE, N. J.

OFFICE,

400 CHESTNUT ST., PHILADELPHIA.

## WOOD WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.



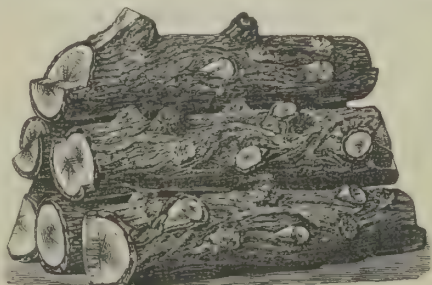
"GIANT" PORTLAND CEMENT,  
"EGYPT" PORTLAND CEMENT,  
"IMPROVED UNION" CEMENT,  
"UNION" CEMENT.

**LESLEY & TRINKLE, Sales Agents, 216 South Third St., Phila.**

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

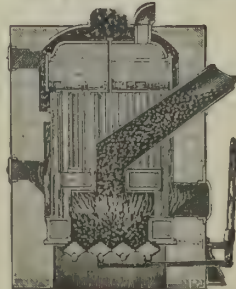
Manufacturers,

1330 Chestnut St., - Phila., Pa.

## SHAW & GEARY,

MANUFACTURERS & DEALERS

**ELECTRICAL APPLIANCES.**  
53 No. Seventh St., PHILADELPHIA.



**The BRONSON Improved MAGAZINE Base-Burning  
STEAM HEATING BOILER.**  
For Steam and Hot Water Heating. Auto-  
matic and Reliable. With Brick or Iron  
Settings, as you may prefer. The Bronson  
is constructed on scientific principles, the  
fire surface being of the best boiler tubing  
that can be obtained. This boiler exposes  
more water to the direct action of the fire,  
either in steam or hot water heating, than  
any boiler made. We are making a  
specialty of a High Grade All-steel Boiler,  
which we are anxious to place by the side  
of anything in the world for actual results.  
Reliable Agents Wanted. Send for illus-  
trated Catalogue and Price List.

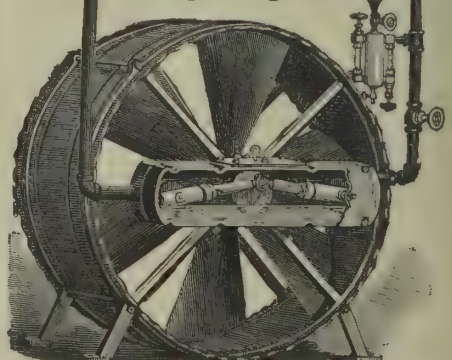
**WESTON ENGINE CO.,**

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sales Agents, 40 Cortlandt Street, New York.



Wing's Disc Fans and  
High Speed Engines.



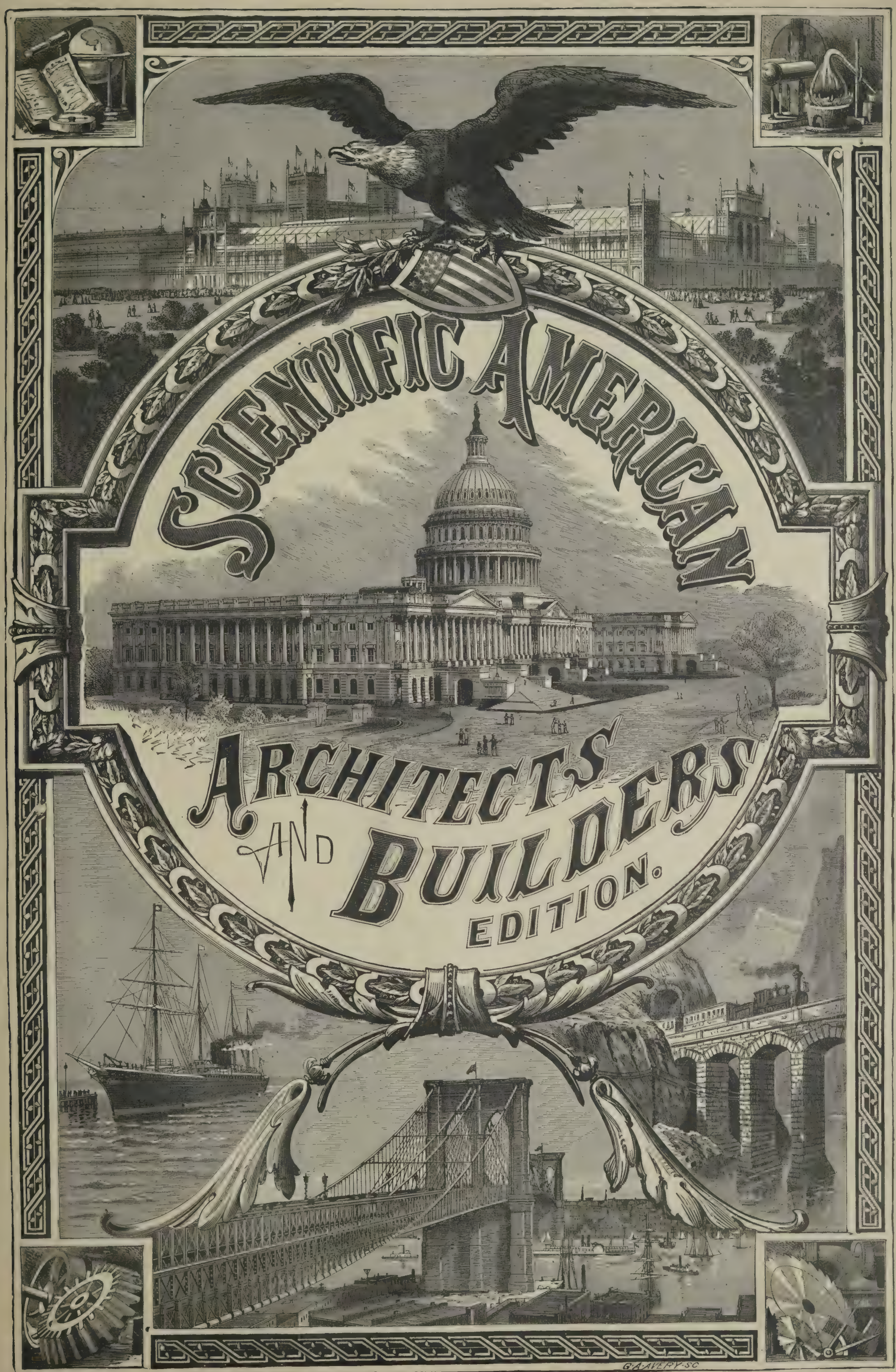
Gold and Silver Medals taken over all other  
Fans.

THE FAN BLADES ARE ADJUSTABLE, and being  
inside of a framework and made of the very  
best material, are perfectly safe. The Fan is noise-  
less, simple, and strong, and will move more air for  
the power used than any Fan in the world. The  
Engine is a great success, and the combination a  
valuable adjunct to Mills, Factories, Tanneries,  
Schools, etc., for drying, heating, cooling, ventilat-  
ing, removing of steam, dust, etc.

Fans furnished for Belting, Electric Motors, etc.

The Simonds Mfg. Co., 50 Cliff St., New York.  
Send for Illustrated Circulars, Prices, etc.





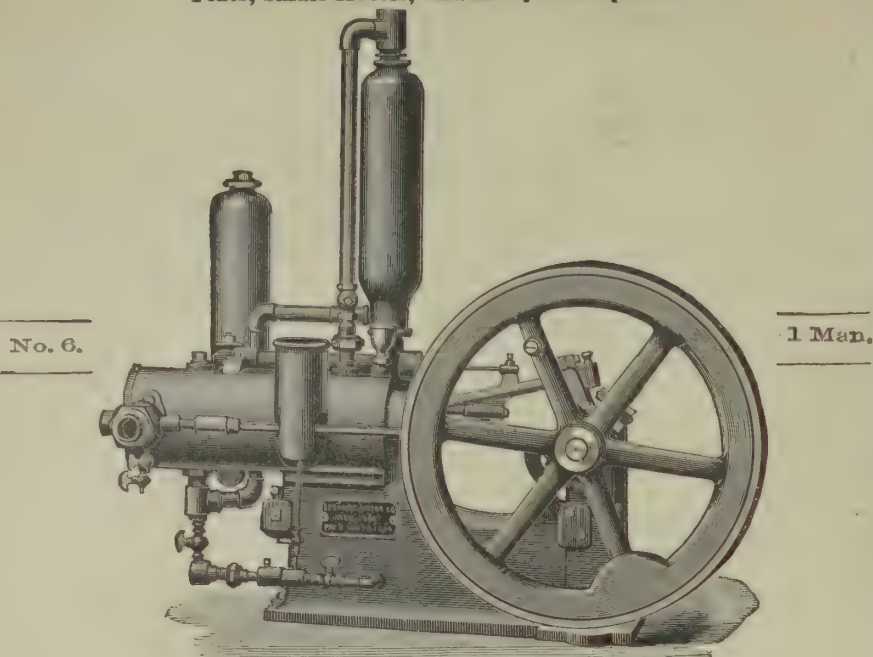


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra Insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

- No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.  
No. 8. One Horse, - 1,500 " " " "

## CASOLINE GAS ENGINES.

- No. 15. One Man, - 300 Gallons, 50 feet High, per Hour.  
No. 16. One-Half Horse, 600 " " " "  
No. 18. One Horse, - 1,500 " " " "

Four Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power. Our Gas Engines will work satisfactorily when attached to Gasoline Machines. SEND FOR ILLUSTRATED CATALOGUE.

**Economic Gas Engine Co.,**  
Office and Salesroom, 34 DEY ST., NEW YORK.

35 YEARS EXPERIENCE  
**STEAM ELEVATORS** SAFETY SPEED  
HYDRAULIC HAND POWER DUMB WAITERS SERVICE  
**THE JAS. L. HAVEN COMPANY.**  
CINCINNATI, O. U.S.A.

**A. H. ABBOTT & CO.** 50 MADISON ST. CHICAGO.  
BLUE PROCESS PAPER - DRAWING PAPER -  
TRACING CLOTH -  
MATH INSTRUMENTS -  
SURVEYING INSTRUMENTS. ARTISTS' MATERIALS.

Are you building a new home? Make it beautiful.

**STAINED and LEADED GLASS.** For Public and Private Buildings. Send for Price List.

## BRAY'S PATENT GLASS MOSAIC

Is the handsomest, best and cheapest

STAINED GLASS!

and far superior to ordinary leaded glass for Door Panels, Transoms, Fire Screens, Hall Lanterns, &c., where fine artistic work is desired.

Illustrated Catalogue on application. Beacon Stained Glass Works, 35 & 37 Province St., Boston, Mass.

Are you erecting a new church? Have it attractive.

## THE OTIS TUBULAR FEED WATER HEATER



With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of

## ELEVATOR PUMPS,

both Passenger and Freight, to heat the Feed Water for the boilers.

We guarantee one square foot of heating surface per horse power. We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.

MANUFACTURED BY

**Stewart Heater COMPANY,**  
40 & 42 Clinton Street, BUFFALO, N. Y.

## COMPOSITE IRON WORKS CO.

83 Reade Street, New York.

Established 1847.

## Artistic Iron Work - FOR - BUILDINGS.



Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



# THE JACKSON Ventilating Grate & Fireplace Furnace



HEATING ON ONE OR TWO FLOORS  
200 DIFFERENT STYLES.

## NINETY

of these Grates ordered for the New Court House at St. Paul, Minn.

## SIXTY

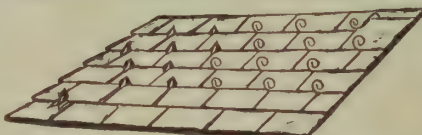
in use in Columbia College, New York.

Send for Catalogue F.

**EDWIN A. JACKSON & BRO.,** 50 Beekman St., New York.

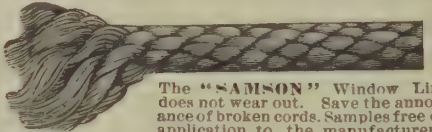
ARCHITECTS, BUILDERS!  
**ATTENTION IS CALLED TO**  
ADVERTISEMENT ON PAGE III  
FRANK B. MALLORY.

SPECIFICATIONS SHOULD INCLUDE  
**Folsom's Patent Roof Snow-Guards**



Address, —300,000 IN USE.—  
**JOHN H. HILLER, 140S Tremont St., Boston.**

## Solid Braided Cotton Sash Cord.



The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers.  
Samson Cordage Works, 164 High St., Boston, Mass.

## SCHUMACHER

—AND—

## ETTLINGER,

## Lithographers,

32, 34 and 36 Bleecker

—AND—

311 Mott Streets,

NEW YORK.

## Fine Color Work

A SPECIALTY.

## HIRES & CO., Limited,

MANUFACTURERS and IMPORTERS,

720 and 722 FILBERT ST., Philadelphia.

FRENCH PLATE  
AMERICAN "  
SILVERED "  
ROUGH "  
RIBBED "

**GLASS**

WINDOW  
PICTURE  
COLORED  
CATHEDRAL  
ORNAMENTAL

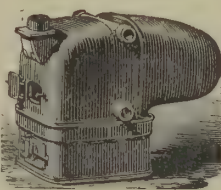
# Dwelling-Warming Hot-Water System.

## HITCHINGS & CO.,

233 MERCER STREET, N. Y.

—ALSO—

## Greenhouse Heating and Ventilating Apparatus.



Estimates of cost furnished on application.

SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.

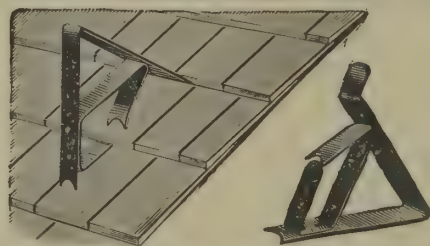


## STANLEY'S PATENT Roofing Bracket.

## STANLEY

Rule & Level Co.  
New Britain, Conn.

SOLD BY ALL  
HARDWARE DEALERS.



The parts are of Spring Steel, firmly riveted together. Push the beveled ends up under two layers of shingles, already nailed down; the Bracket has two separate bearings on the roof, and is so formed that any increase of pressure from above, increases its stability. One dozen per minute can be placed in position, or removed; and great economy in lumber and nails will be found. There are no loose parts to get lost; and no nail-holes are made in the roof.  
No. 1. Roofing Brackets, 8 inch, 1/2 dozen in box. Per Doz., \$3.00  
No. 2. Roofing Brackets, 10 inch, 1/2 dozen in box. Per Doz., 4.00



# SCIENTIFIC AMERICAN

Entered at the Post Office of

AND BUILDERS

New York as Second Class Matter.

ARCHITECTS

EDITION.

Vol. VI. Subscription, \$2.50 a Year.

NEW YORK, OCTOBER, 1888.

Single Copies, 25 Cents. No. 4.



NEW PROTESTANT CHURCH AT LYONS, FRANCE.

[For description see page 68.]





# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

\* NEW YORK, OCTOBER, 1888.

THE

## Scientific American, ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid **Magazine of Architecture**, richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

**An Increase of Trade** will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

**Bound Volumes.**—Two volumes are published annually. Volumes 1, 2, 3, and 4, which include all the numbers of this work from commencement to close of 1887, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN &amp; CO., Publishers,

361 BROADWAY, NEW YORK.

For additional information concerning any of the plans or buildings illustrated in these pages, address MUNN & Co., as above.

### CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN &amp; Co., Publishers, 361 Broadway, New York.

### CONTENTS

Of the October number of the ARCHITECTS AND BUILDERS EDITION  
OF SCIENTIFIC AMERICAN.  
(Illustrated articles are marked with an asterisk.)

Army, regimental, new, New York City.....	68	Lime from oyster shells.....	72
Church, Protestant, new, at Lyons, France.....	67	Mark, division, a heat.....	61
City, ruined, in Texas.....	69	Northwestern Architect and Improvement Record.....	84
Clematis porch.....	73	Notes and queries.....	71
Clematis over porch.....	73	Orchids.....	73
Coal, feeding to the fire.....	80	Park, zoological, national.....	68
Cottage, Anne Hathaway's.....	76	Pipes, ventilating.....	64
Cottage of moderate cost.....	80	Plans, floor, for suburban dwelling of moderate cost.....	72
Cottage, Queen Anne, in Rochelle Park.....	81	Plans of Queen Anne cottage.....	82
Cottage at Wilmette, residence of Shakespeare's mother.....	76	Plumbing, defects in, in Maine Insane Asylum.....	84
Cottages, two economical.....	71	Quicksand.....	75
Creeper, Virginia, some ways of using.....	78	Residence at Richmond Hill.....	68
Details for suburban dwelling of moderate cost.....	70	Road construction, Roman.....	74
Disinfection, practical hints on.....	84	Rodriguezis recurva.....	73
Dwelling for \$3.50.....	74	Rot, dry.....	78
Dwelling, suburban, of moderate cost.....	68	Saw, circular and scroll, combined.....	84
Farm, California.....	68	Saw, rip, circular, hand and foot power.....	84
Fence and garden, arbor clothed in green.....	78	Sewage disposal in Great Britain.....	77
Gate posts and fence covered with Virginia creeper.....	78	Shakespeare, home of.....	68
House, club, Duquesne, design for.....	69	Shaper, improved reversible.....	84
House, double, Knickerbocker.....	82	Shaper or reversible moulder, improved, for wood working.....	80
House, old Elizabethan, Stratford.....	76	Tower, church, stone, fall of.....	84
House in which Shakespeare was born.....	76	Trinity Church, Stratford on Avon.....	76
Larch, beauty of.....	77	Villa at Fontainebleau.....	79
Lathing, fireproof wire.....	78	Window, memorial, Trinity Church, Stratford on Avon.....	77
		Wood that will not blaze.....	80

### THE HOME OF SHAKESPEARE.

We give on pages 76, 77 a series of interesting illustrations of Stratford-on-Avon, for which we are indebted to the London *Graphic*. Among the engravings is one of the splendid memorial window erected at the expense of American visitors, in the church where the poet was buried.

### A SUBURBAN DWELLING OF MODERATE COST.

One of our colored plates this month shows a suburban dwelling, of which we give the floor plans on page 72, and the details on page 70.

The measurements are: Front 35', including bays; side 65', not including piazza.

For size of rooms, see floor plans.

Height of cellar, 7'; first story, 10'; second story, 9' 6"; attic, 8'.

Foundation, 6" stone; first story, clapboards; second story, clapboards. Shingles above second story windows and gables. Roof, slate. Cost \$8,500, without mantels and furnace.

Among the special features are: Open fireplaces in parlor, library, dining room, and front chamber.

There is a good feature in main hall in the shape of an octagon at platform of main stairs, which gives a fine appearance.

Rooms are well arranged and convenient, three rooms finished in attic, and a cellar under whole house.

### TWO ECONOMICAL COTTAGES.

One of our colored plates this month shows a pair of economical cottages, of which we give, on page 73, the floor plans, and on page 71 the details. Referring to the house on the left in our colored plate, the front measures 18'; side 26', not including piazza.

For size of rooms, see floor plans.

Height of cellar, 6' 6"; first story, 8'; second story, 8'.

Foundation of 8" brick; first story and second story, novelty siding; gables, shingles; roof, shingles. Cost \$1,200.

Among the special features is a large entrance hall, and cellar under whole house.

Referring to the house on the right, the front measures 20', not including piazza; side 25', not including piazza or bay.

For size of rooms, see floor plans.

Height of cellar, 6' 6"; first story, 8'; second story, 8'.

Foundation, 8" brick; first story and second story, novelty siding; gables, shingled; roof, shingled. Cost \$1,600.

Among the special features are: Cellar under whole house, large octagon piazza, staircase conveniently arranged.

### NEW PROTESTANT CHURCH AT LYONS, FRANCE.

The Reformed Church of Lyons forms but a single parish, for the needs of which the Loge du Change constructed in the old city no longer sufficed. There was need of a second house of worship, situated in the new quarters, and the architect, Mr. Andre, had to build this, with its annexes, upon a superficies of 9,245 feet, limited laterally by common walls.

The new building, in order to render the services expected of it, had to contain half more space than the old temple, and the stories of the back part of the edifice had to receive, along with a catechism room, class rooms for children of both sexes and a large wardrobe storeroom for the poor.

There was some difficulty in deciding upon the form to give to the front in order to hide the ugly walls to the right and left, and the slope of the ground, which was quite steep. How the architect acquitted himself of his task is shown in the accompanying engraving.

The structure, including furniture, hangings, and organs, cost \$80,000.—*Revue Generale l'Architecture*.

### A New Regimental Armory, New York City.

The plans selected for the new armory for the 22d Regiment were prepared by Captain Leo, of Company I, and will give a building within the appropriation of \$300,000. There will be ample waiting and toilet rooms, shower and plunge baths, magazines, and bowling alleys. In the basement will be a rifle range 300 feet long and 25 feet wide. The drill room will be on the first floor, and 175 feet wide by 235 feet long. On the northerly side of this room will be ten company locker rooms for the uniforms, and above these ten company parlors, each with a gallery capable of seating fifty people. On the right of the entrance, through a corridor fifteen feet wide, will be a handsome library and rooms for field, staff, non-commissioned staff, and the headquarters. The main exit and entrance for the regiment will allow for the entrance of guns or cavalry.

On the second story will be a large, handsome room, extending through two stories, and committee and examination rooms for the use of the board of officers. There will be also a non-commissioned officers' association room and ample squad and drill room.

In the third story will be the kitchen, with ample conveniences, a large gymnasium, a mess hall, and the janitor's apartments.

In the tower will be located the hospital and medical

department, and arrangements have also been made for a solarium for the care of the sick. One of the strong features of the plan is the introduction of a fire system, the first of the kind in any of the armory buildings. The building will be trimmed throughout in hardwood, and will be one of the most, if not the most, complete buildings of its kind in the State. The cost will not exceed \$300,000.

### Ventilating Pipes.

The quantity of air discharged per minute through a ventilator is variously stated, though one of the fundamental things to be known in ventilating any room. Of course the principle of the discharge is the difference in the temperature between the room and the external air—the greater the difference the more rapid the current, other things being equal; the height of ventilator is also an important condition. To take Hood's calculations, we find that, supposing the height of ventilator is 1 ft.—an ordinary height of a room exit—and the difference between the interior and outer air is 5°, the cubic feet of air discharged per minute through a ventilator of 1 ft. square is 116 ft. At a height of 15 ft. the discharge is 142 c. ft.; at 20 ft., 164 ft.; at 30 ft. it is 201 ft.; at 40 ft. in height it is 235 ft.; and at 50 ft. the discharge is 260 c. ft. With a difference of 10° the discharge is for 10 ft. height of ventilator 164 c. ft., which is just equal to the discharge through a ventilator 20 ft. high and with a 5° difference of temperature. At 15 ft. the discharge is 202 c. ft.; at 20 ft., 232 c. ft.; at 30 ft., 284 c. ft.; at 40 ft., 329 c. ft.; and at 50 ft. high, 367 c. ft. These figures are sufficient to show that height and temperature are both important conditions to the effectual ventilation of buildings, and that, if we cannot be sure of having our interiors warmer than the outer air—a state of things not unknown during summer weather—it is very necessary to place the outlet for vitiated air as high as it can be conveniently arranged.

### A RESIDENCE AT RICHMOND HILL, N. Y.

Among the beautiful suburbs of New York is Richmond Hill, on Long Island. From among the elegant residences there to be seen, we have selected for illustration that of Dr. Crosby, lately built, at a cost of \$10,000.

It is prettily situated on a rise of ground, and takes in an extensive view of the surrounding country.

There are thirteen rooms in this house. All are large and conveniently arranged, with the modern improvements.

The elevations are all very attractive.

The first story is covered with shingles, laid random and left to weather finish, while the second story is covered with circular cut shingles.

There is a cemented cellar under whole of house, which contains, coal, wood, and furnace room provided with a heater.

The first floor contains parlor, library, with conservatory, dining room, kitchen, large front hall and rear hall, with stairs leading to cellar and second floor.

The library is finished in redwood, and the parlor, dining room, and hall are finished in ash. The office and lobby is of whitewood.

The door and window casings throughout are neatly beaded and band moulded.

The hall has a pretty staircase in ash, with neatly turned newels, posts, balusters, and rail.

Several rooms have open fireplaces, with artistic hearths and mantels.

The kitchen is wainscoted, supplied with hot and cold water, and a range, a pantry neatly fitted up, a store closet for ice chest, a butler's pantry and cupboard complete.

On the second floor there are four good sized bedrooms, bath room, linen closet, dressing room, and water closet.

The trims of these rooms are of whitewood, natural finish.

The bedrooms are cheerful, and are provided with neatly fitted up closets.

Linen closet, with shelves, drawers, etc.

Bath room and water closet wainscoted and neatly fitted.

Attic is finished and contains four nicely appointed rooms.

The house is piped for gas.

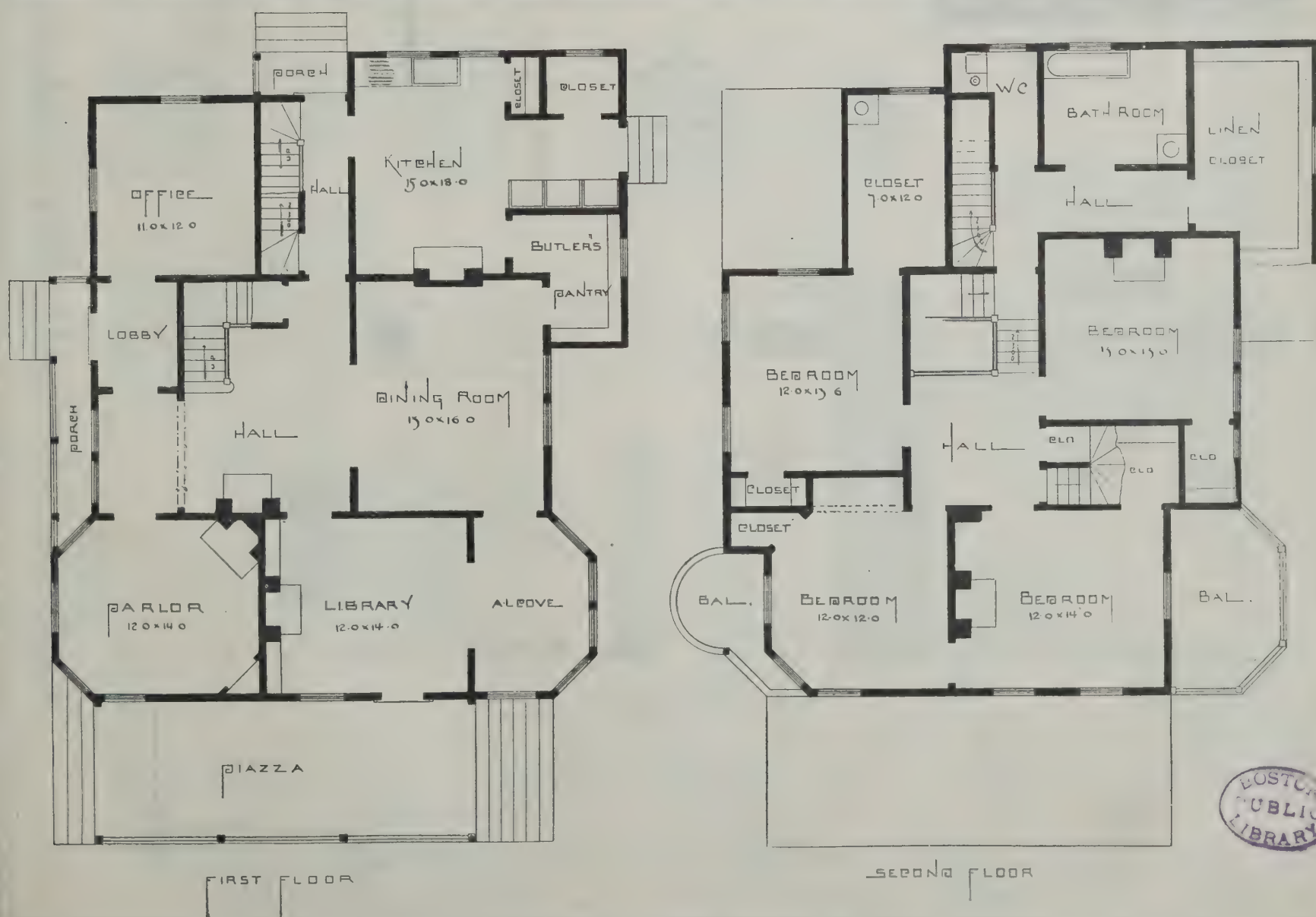
The ceilings are corniced and pretty, and have artistic flower pieces.

Our engraving was made direct from a photograph of the house taken specially for the SCIENTIFIC AMERICAN.

### National Zoological Park.

According to the *American Naturalist*, the proposed site of the National Zoological Park, at Washington, is one of great beauty, and even grandeur. It is in the valley of Rock Creek, just beyond the city limits, and at two points walls of rock rise to a height of over eighty feet. The Rock Creek will afford what the *American Naturalist* describes as "unrivalled facilities" for the care of aquatic mammals and birds of all kinds. Nearly the whole tract is covered by a fine growth of forest trees.

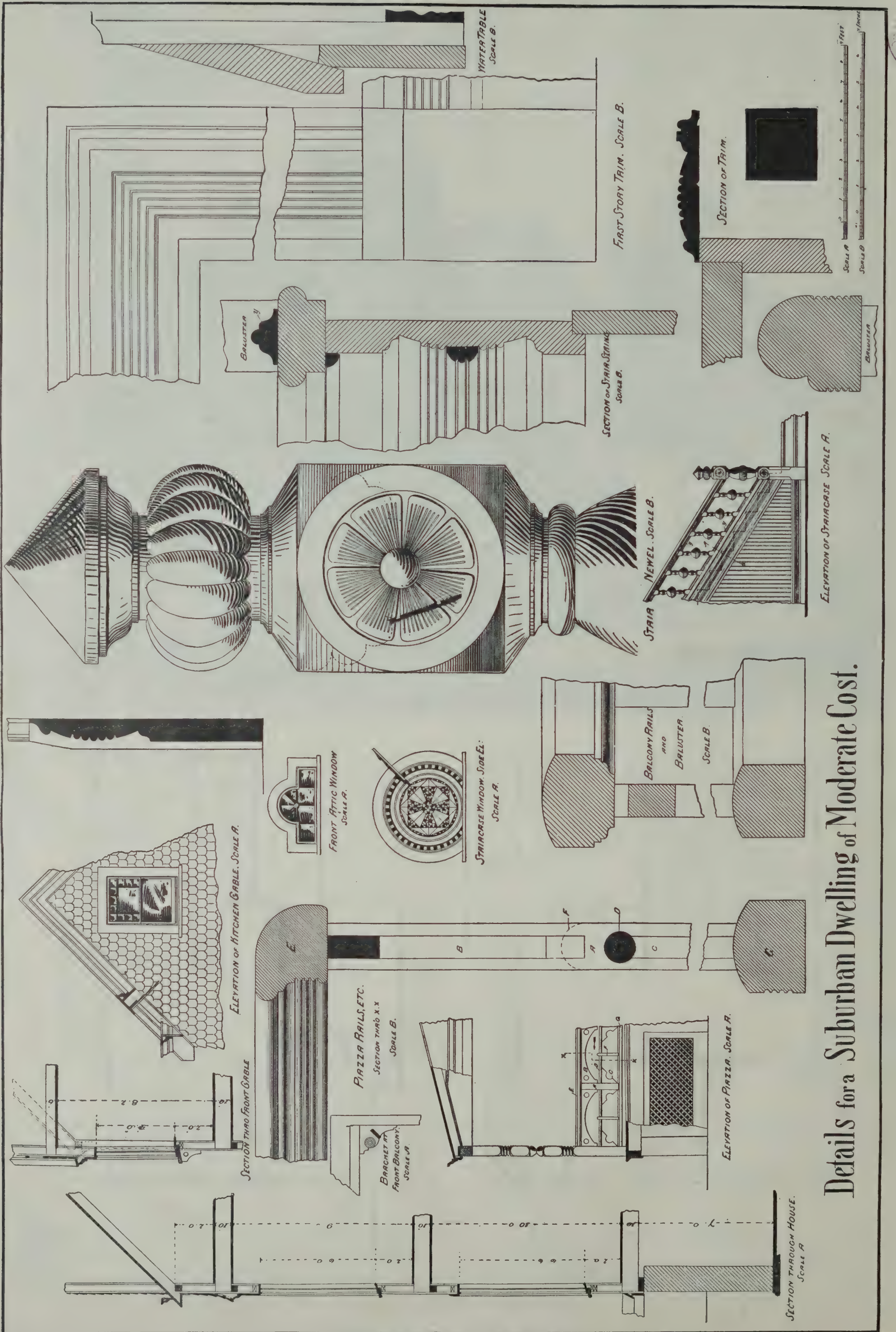




A RESIDENCE AT RICHMOND HILL, N. Y.

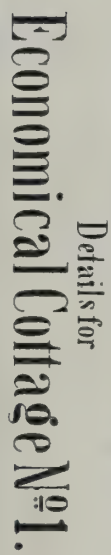
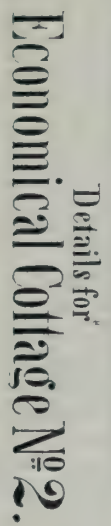






Details for a Suburban Dwelling of Moderate Cost.





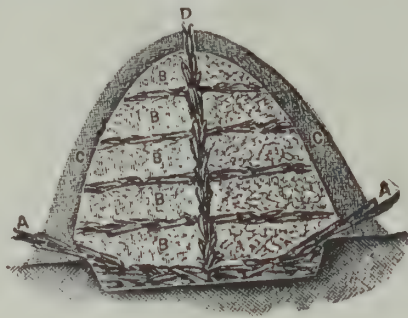


## LIME FROM OYSTER SHELLS.

Lime is made by burning limestone, which is carbonate of lime, or shells of mollusks, as oysters, clams, mussels, or water animals, lobsters, etc., these shells also being carbonate of lime. Carbonate of lime is a compound of lime and carbonic acid. It is, as we term it, mild—that is, free from caustic or burning qualities; the acid neutralizes these qualities, which exist in the lime, by its combination with it. The heat of the fire expels the carbonic acid from the limestone or the shells, and leaves the lime pure. Lime has exceedingly active qualities. It is caustic, dry, acrid, and alkaline. It decomposes vegetable and animal matter, by taking water and carbonic acid from them, and it has so strong an affinity for water that it will absorb one third of its weight of it, and yet remain apparently perfectly dry; but in absorbing this water, it falls to a very fine powder called dry or air slaked lime. There is no other process by which lime can be made from the stone or shells than by burning. Ground shells are not lime, but carbonate of lime, which is of little or no use as a fertilizer, as it is not soluble in water, and has no active qualities, and cannot consequently exert any effect upon the soil or vegetation.

But lime is soluble in water; 700 times its weight of water dissolves one part of lime. The lime then becomes available for food for crops, which invariably contain more or less of this mineral. It also then exerts a very useful chemical action upon the soil itself, and upon any organic matter (vegetable substances, manure, etc.) which may remain undecomposed in the soil. Hence it is rightly considered of much value as a fertilizer.

Limestone very often contains magnesia and other impurities, which reduce its value, or are noxious to the crops. Shells, on the other hand, are free from all impurities, containing pure lime, with a small quantity of phosphoric acid, which is valuable. Thus shell lime is better for the farmer's use, when he can get it, than



PIT FOR BURNING SHELLS.

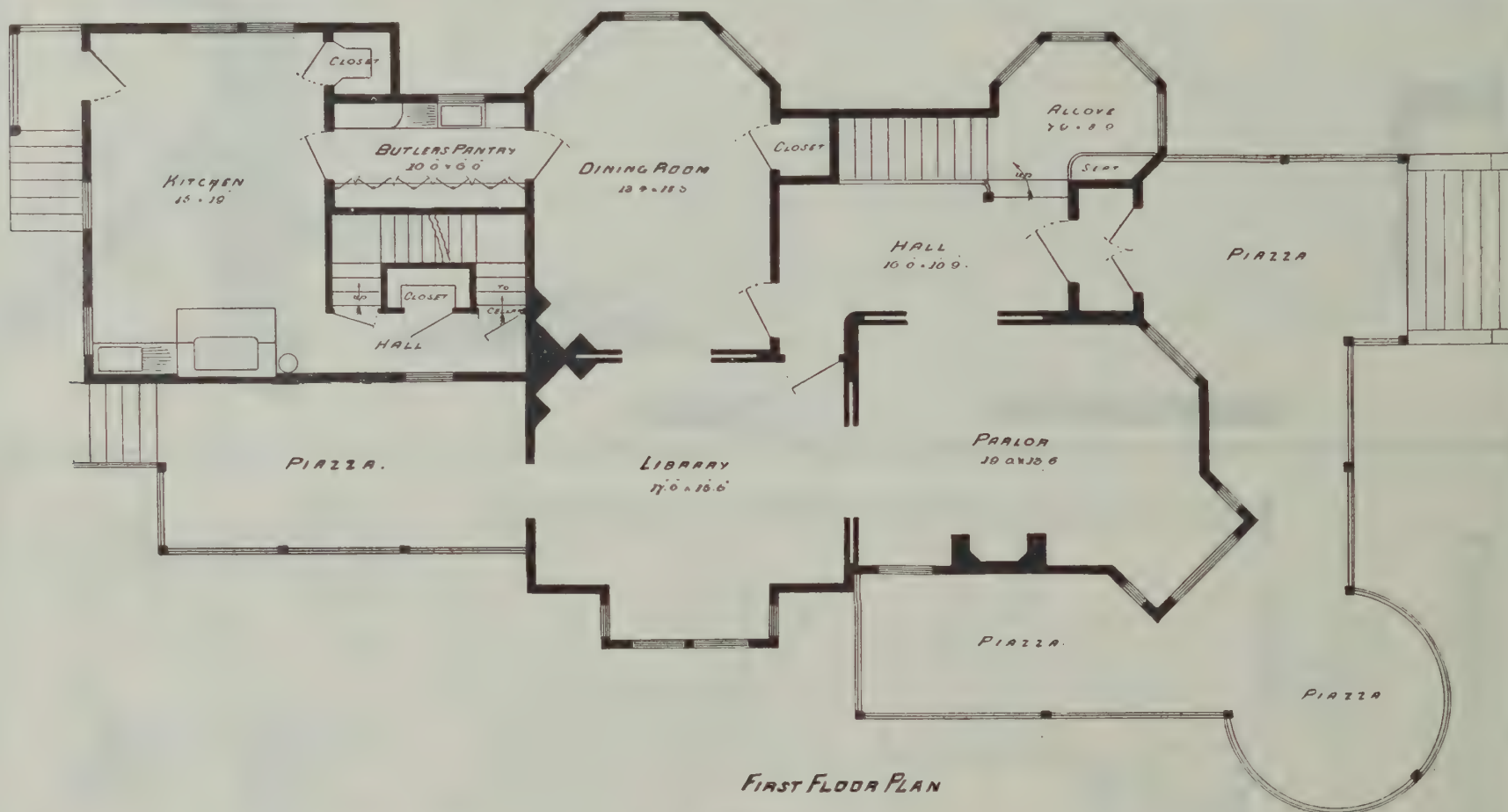
A, kindling wood; B, shells; C, earth; D, chimney.

the stone lime. Shells are very easily reduced to lime by burning them in the following manner:

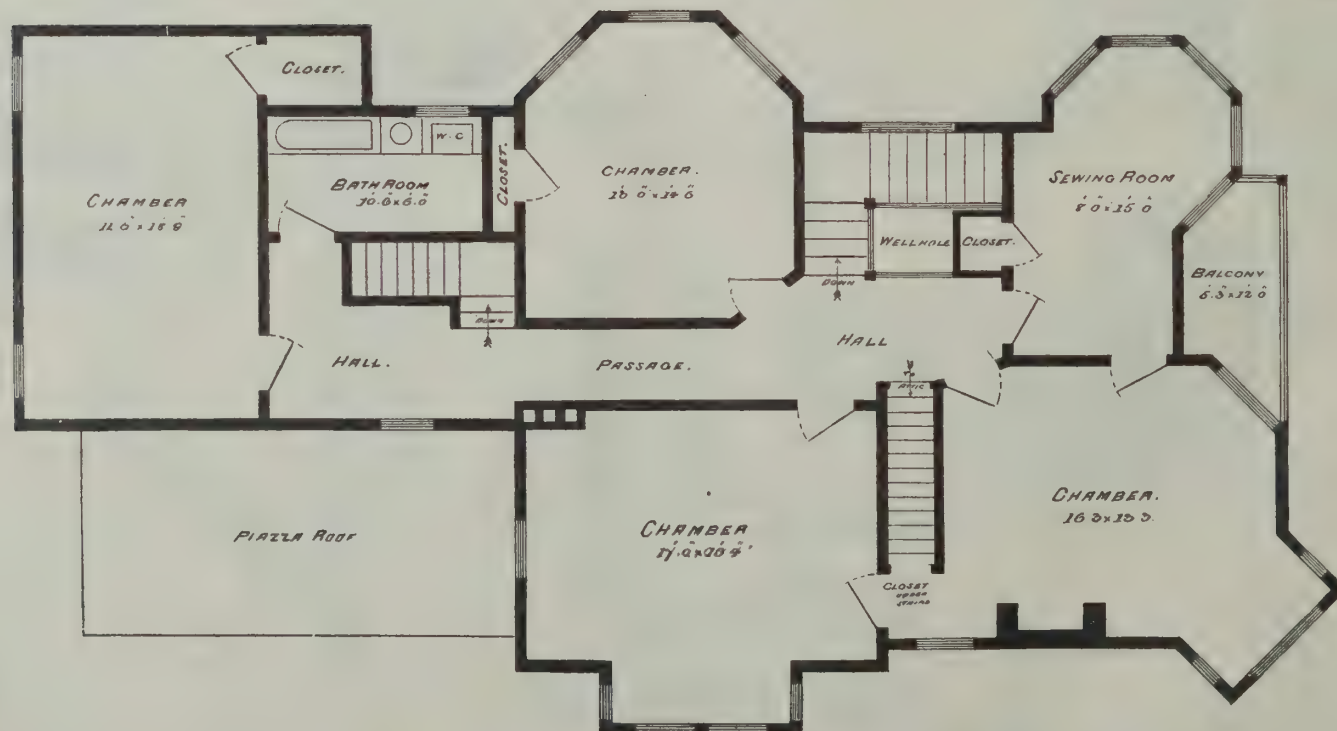
A pit is dug ten feet in diameter and one or two feet deep; the earth is thrown out all around on the bank. A quantity of small wood, brush and limbs are packed in the bottom for a foot in depth, and kindling wood is set up in the center and around the pit, as shown in the engraving. Shells are then put on the wood about a foot deep, then more wood is laid on, and then shells, and so on, until a rounded heap is made, as shown. The kindling is carried up the center so as to carry the

fire to the wood all through the heap. Leaves or fine brush are laid on the shells, and then the earth is laid on these and packed firmly. A hole is left on the top (a ladder of plank, with cross cleats for steps, is made to reach the top) for a draught, and fire is set to the kindling at the sides, by live coals, and more coals are dropped among the kindling on the top. A few holes are left near the bottom to give air until the fire is well started, when they are nearly all closed, so as to keep a slow fire, which will burn out in three or four days. As the pit settles, it is beaten down and more earth is put on to close cracks, and keep the fire from breaking out. When the fire is all burned out, the heap is left to cool, and the shells will then be lime, suitable for all purposes for which it is used, but especially valuable for the land. Forty bushels per acre (or two small wagon loads) may be used, spread evenly on the plowed ground, and harrowed in just before planting. It should never be plowed in, as it is most useful near the surface. It is no harm if the lime is used with manure, if both are well mixed with the soil, and the land is planted or sown at once. The results are that the manure is quickly decomposed, nitrogen compounds are developed, and the first crop gets nearly the whole benefit of both lime and manure. But lime should never be used with superphosphate, because it unites with the soluble phosphoric acid, and makes an insoluble phosphate of lime, which is only slowly available for the crops.—*Country Gentleman*.

It is claimed that about 1,000 years ago the Japanese knew of the existence of petroleum and natural gas, but have only recently found out how to use them.



FIRST FLOOR PLAN

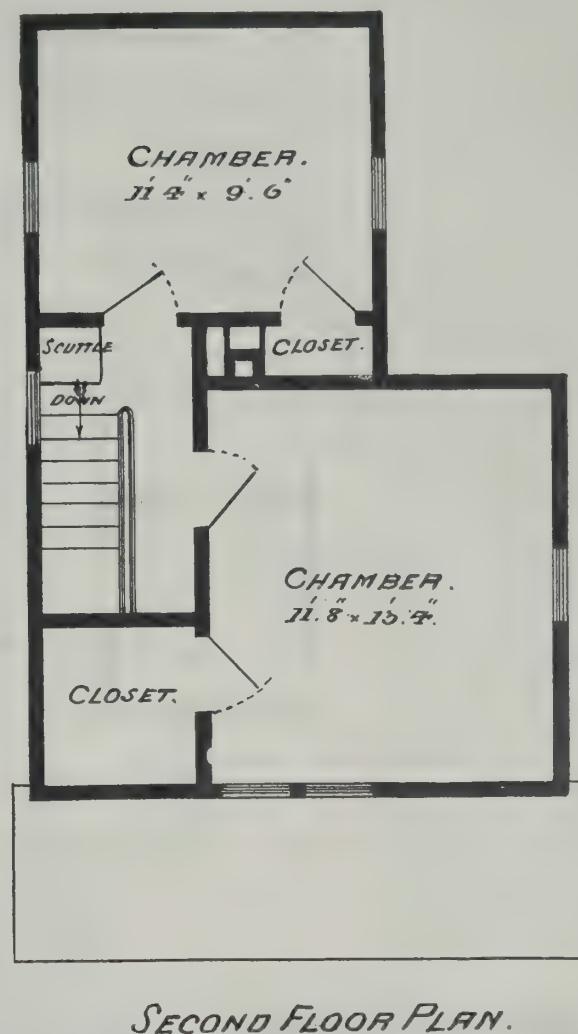
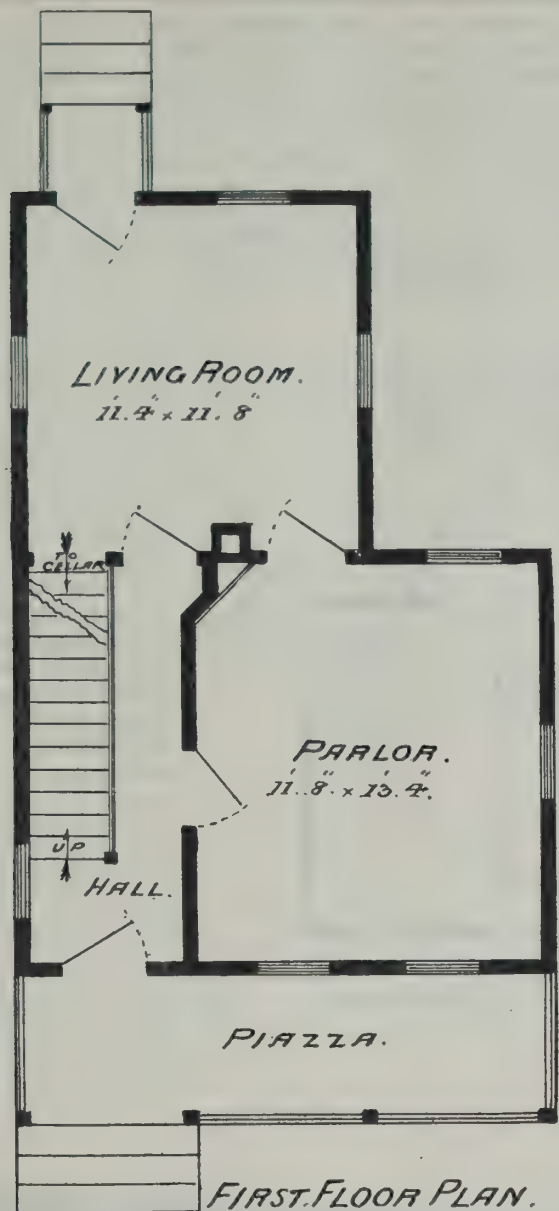


SECOND FLOOR PLAN.

## FLOOR PLANS FOR SUBURBAN DWELLING OF MODERATE COST.

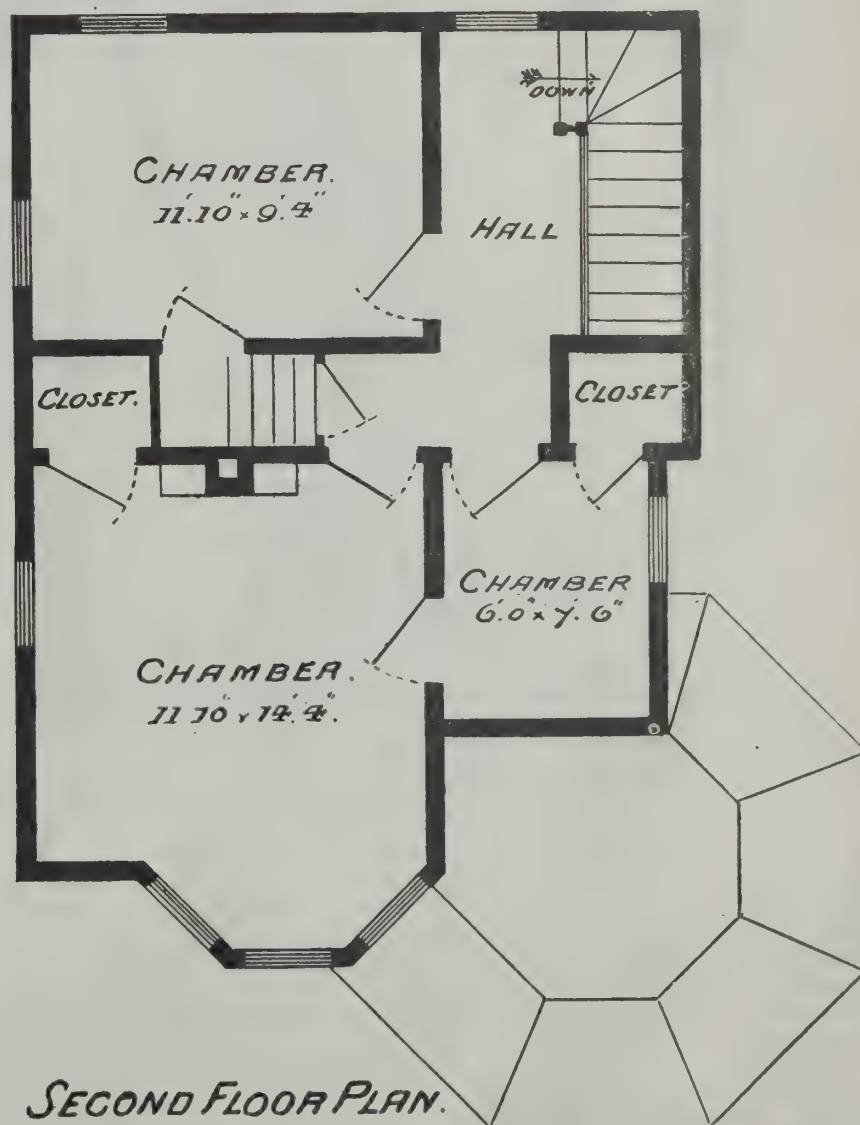
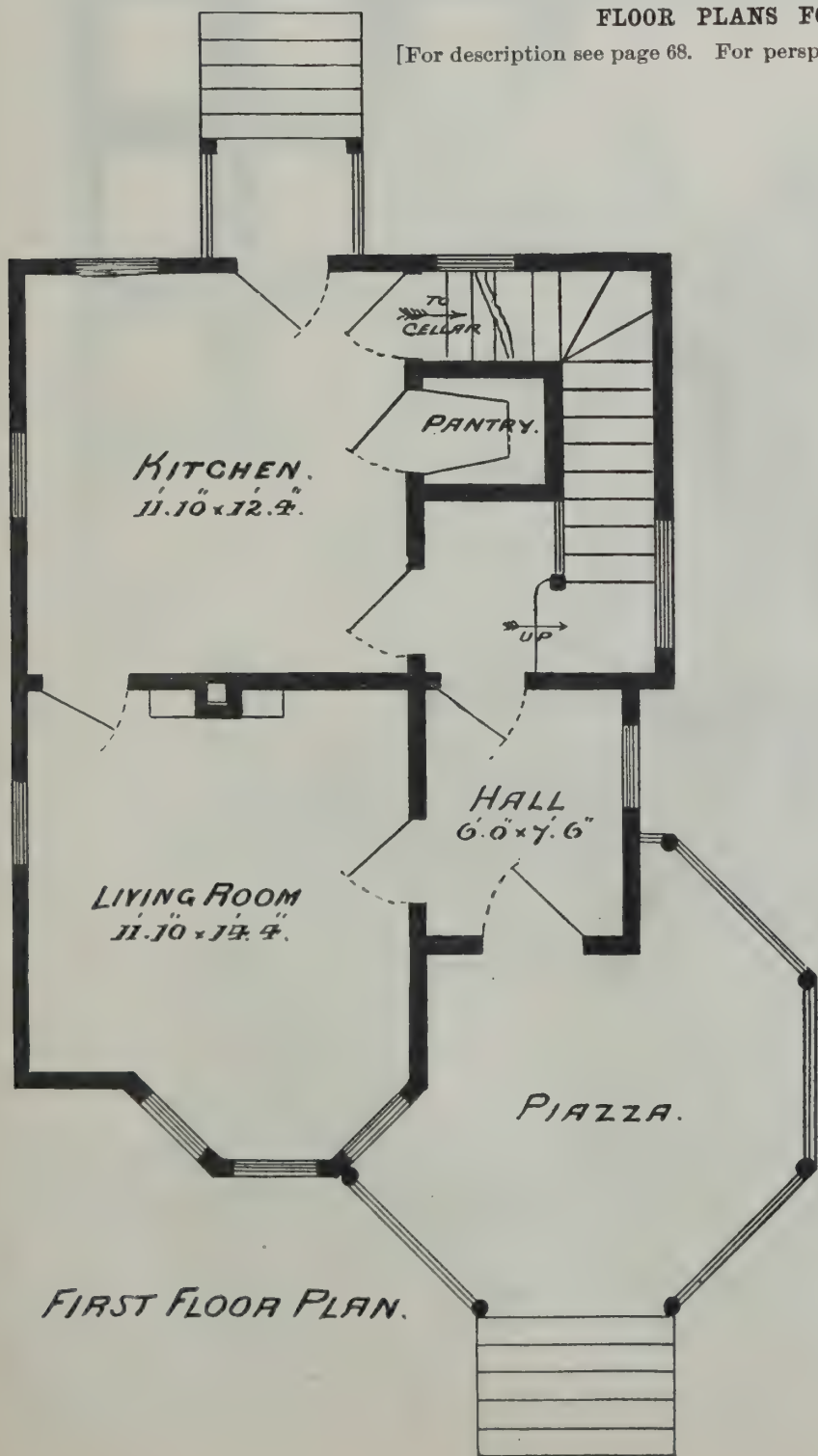
[For description see page 68. For perspective see colored plate. For details see page 70.]





FLOOR PLANS FOR TWO ECONOMICAL COTTAGES.

[For description see page 68. For perspective views see colored plates. For details see page 71.]





A DWELLING FOR \$3,500.

The front measures 30', not including bay. Side, 36', not including piazza.

For size of rooms see floor plans.

Height of cellar, 7'; first story, 9' 2"; second story, 8' 8"; attic, 8'. Foundation, 16", stone; first story, clapboards; second story, shingles; gables, paneled and plastered; roof, shingles. Cost, without furnace and mantels, \$3,500.

There are open fireplaces in dining, sitting rooms and one chamber. Parlor, sitting room, and hall connected with sliding doors.

Wide, spacious hall.

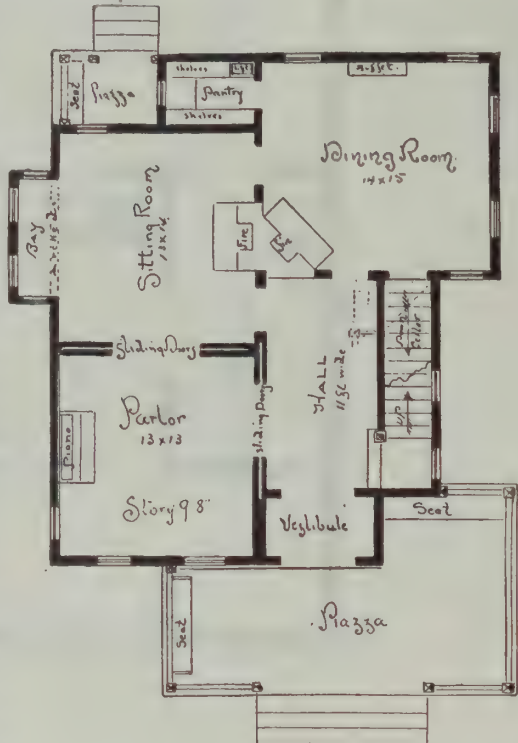
Bath room located in extreme rear of house.

Roman Road Construction.

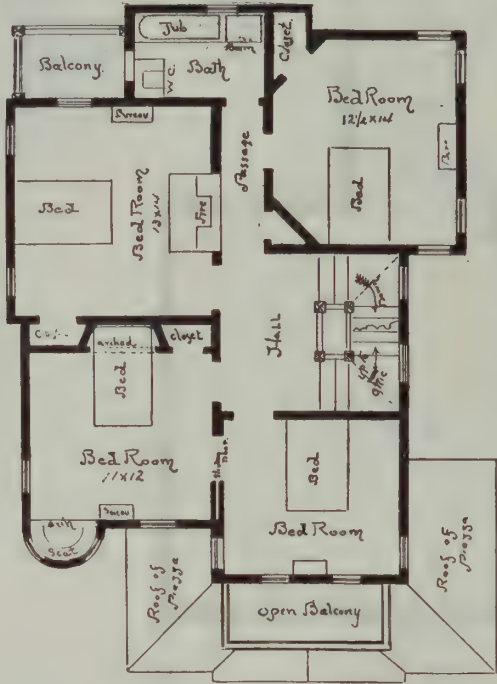
We possess original accounts of the Roman mode of constructing roads from two very different sources—the one from the architect Vitruvius and the other from the poet Statius. The architect gives us clear and distinct specifications, which no contractor could mistake; while the poet describes the busy scene so vividly that we cannot fail to realize it in all its details. The passage of Vitruvius to which we refer is the first chapter of his seventh book, which is entitled "De Ruderationibus." I know no English word which exactly translates the Latin *rudatio*. It means, as sufficiently appears from the description given, the placing of materials of all sorts so as to prepare a solid and secure resting place

sent day. The general mode of proceeding, both as enjoined by Vitruvius and as described by Statius, was the following; The road was lined out as straight as possible, and the width marked by a trench at each side. The next step was to remove the whole of the soil betwixt the trenches to the full depth of the road. If the ground at the bottom was found to be firm and solid, the surface of it was leveled, and the work proceeded—"quærat solum si sit perpetuo solidum et ita exæquatur;" but if not, then piles were driven to secure it—"si autem omnis aut ex parte congestitus locus

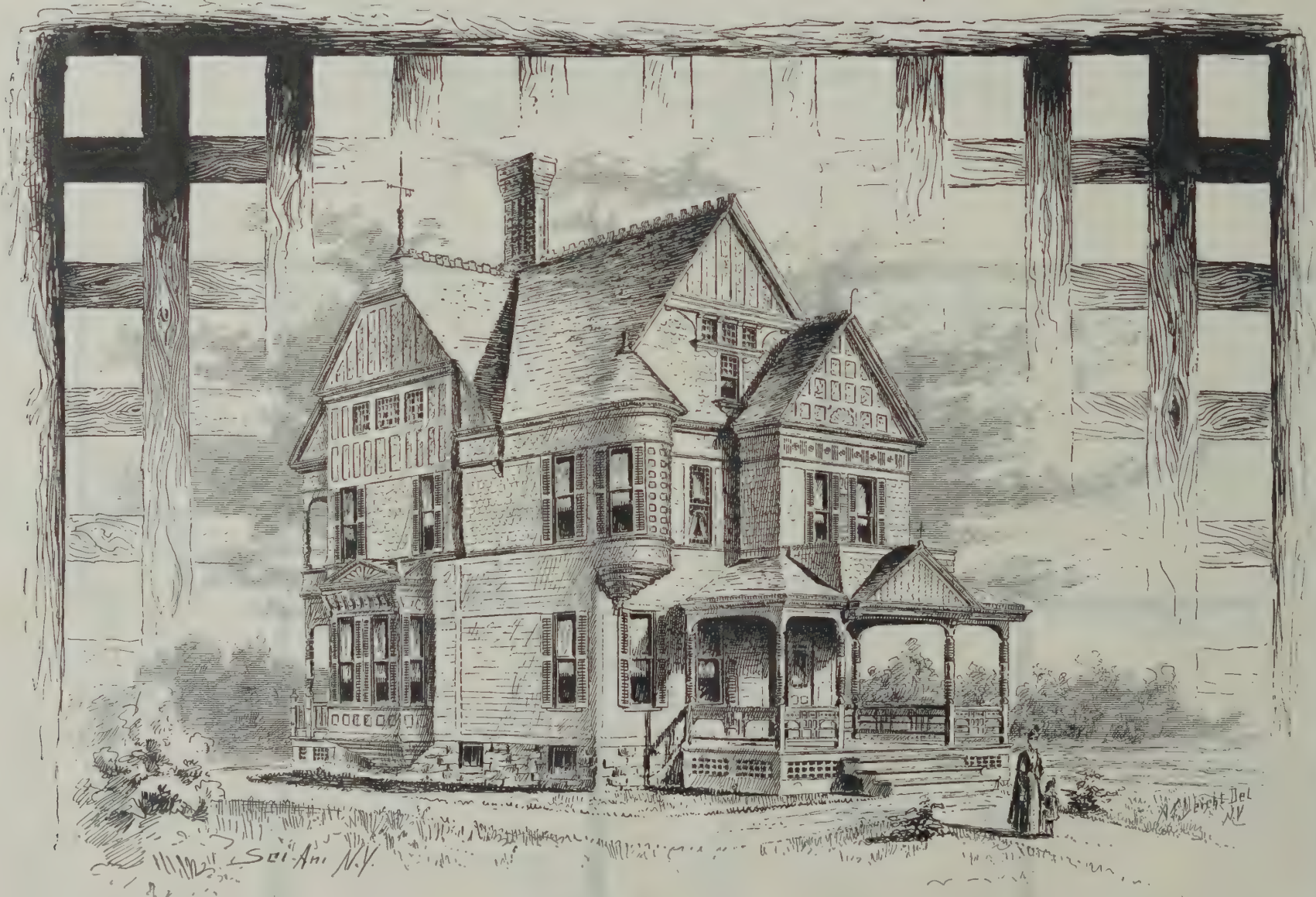
The ordinary depth, as seen in sections, seems to have been from 12 to 18 inches. On the statumen was placed the rudus, a mass of small broken stones mixed with lime water, thoroughly beat together and smoothed, and when finished not less than 9 inches thick. Isodorus thus explains what the rudus was: "Workmen call broken stones, mixed with lime poured over them in constructing pavements, the rudus." Vitruvius gives distinct directions for preparing and finishing it. The lime mortar was to be in the proportion of one-third if the materials were new, and of two-fifths if they were old. And after it was laid on, it was leveled and thoroughly beat together by parties of ten men, with heavy wooden mallets, till brought to the thickness of 9 inches, and leveled. Above the rudus came the nucleus. It was a layer of broken bricks, tiles, and pottery, with the addition of a third part of lime mortar, and having, when finished, a depth of 6 inches. Such were the careful preparations to form a suitable bed for the roadway. The roadway itself, in the best roads, was formed of blocks of basalt, the ancient silex (and modern selce), carefully laid by rule and level. These blocks were of various sizes, but usually from 9 to 12 inches deep, and the sides cut into polygons, and so closely fitted together that a newly-made road appeared to be of one stone. This most durable material occurs in many parts of the Campagna, as noticed in a former paper. On each



First Story Plan



Second Story Plan



A DWELLING FOR \$3,500.

for the superincumbent structure, whether that might be the wall of a house, a floor, a pavement, or a roadway. The object of Vitruvius in writing the chapter evidently is to give rules for rudatio, without regard to the structure which was to be raised upon it, only distinguishing in one part betwixt out-of-door and in-door work; and it might be read without being aware of its application to road making, did not the remains of ancient *vias* show us that their lower strata are formed precisely in the manner he prescribes; and his specifications for each part of the work are so distinct that they might be carried into execution without difficulty at the pre-

fuerit *fistucationibus* cum magna cura solidetur." Thus a place was prepared to receive the mass of materials which formed the body of the road; this was termed the *gremium*, and the whole purpose of it was to prepare a suitable and durable bed for the upper surface—the pavement or roadway. The *gremium* consisted of three distinct parts—the lowest being the *statumen*, the middle the *rudus*, and the uppermost the *nucleus*. The *statumen* varied in depth according to circumstances. It was laid upon the surface of the bed of the road, whether the natural soil or the tops of the piles, and was composed of rough, hard stones, not one of which was to be smaller than to fill the hand.

side of a complete road was a footpath raised above the level of the roadway, sometimes paved like the road, sometimes only covered with gravel (*glarea*), but in either case having a carefully placed margin of stones, termed *gomphi*.

The center of the roadway, the agger, stood higher than the sides, in order that the water might easily flow from it. It is very obvious that roads constructed as now described must have been most durable, and Vitruvius concludes his chapter by asserting that when the foundations have been thus made, they will not soon go out of repair.—A. Thompson.



A FRENCH VILLA.

This house, the designs of which were exhibited in this year's *Salon*, is very simple in plan, but very attractive in *silhouette*. All of the divisions can easily be entered from the outside.

The first floor: Three rooms (drawing room, parlor, and dining room), with a veranda or porch which is reached by several stone steps, as is shown in the accompanying perspective view taken from *La Semaine des Constructeurs*. The drawing room and parlor are so arranged that, when necessary, they can be thrown into one room, which is accessible from the outside by a large window in the main facade.

The staircase, which is inclosed in a tower forming a projection at the angle of the edifice, is easily recognized from the out-

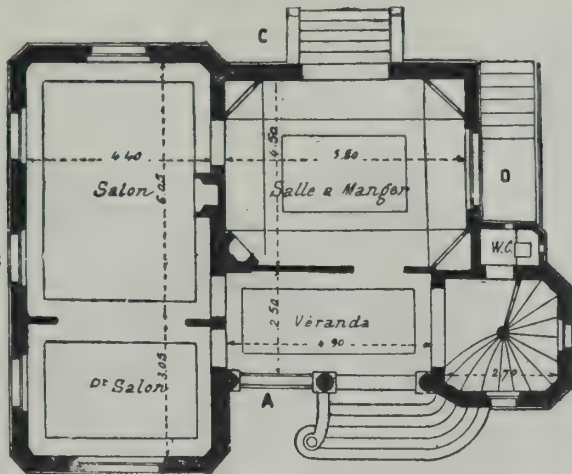
side by its narrow windows. The pyramidal roof which surmounts it and the heavy cornice give a still more decided character to this part of the structure.

The materials employed are brick for the main part, stone for the trimmings, and rough stone for the basement. Artistic faïences of Choisy-le-Roi are distributed

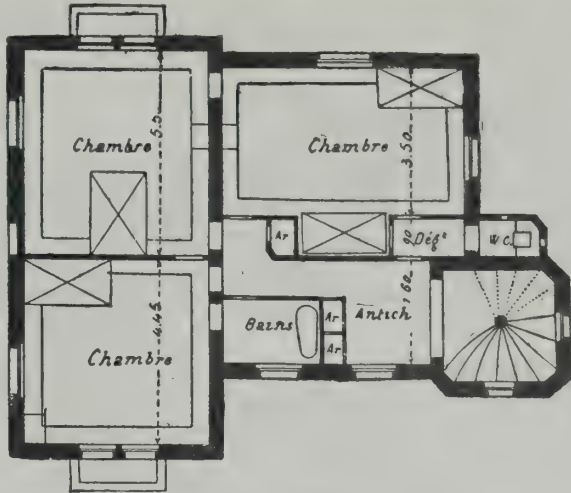
over the facade. The decoration of the dining room is in walnut and faïence of the Renaissance style.

The estimated cost is about \$8,600, not including the interior decorations, such as carved mantels, etc.

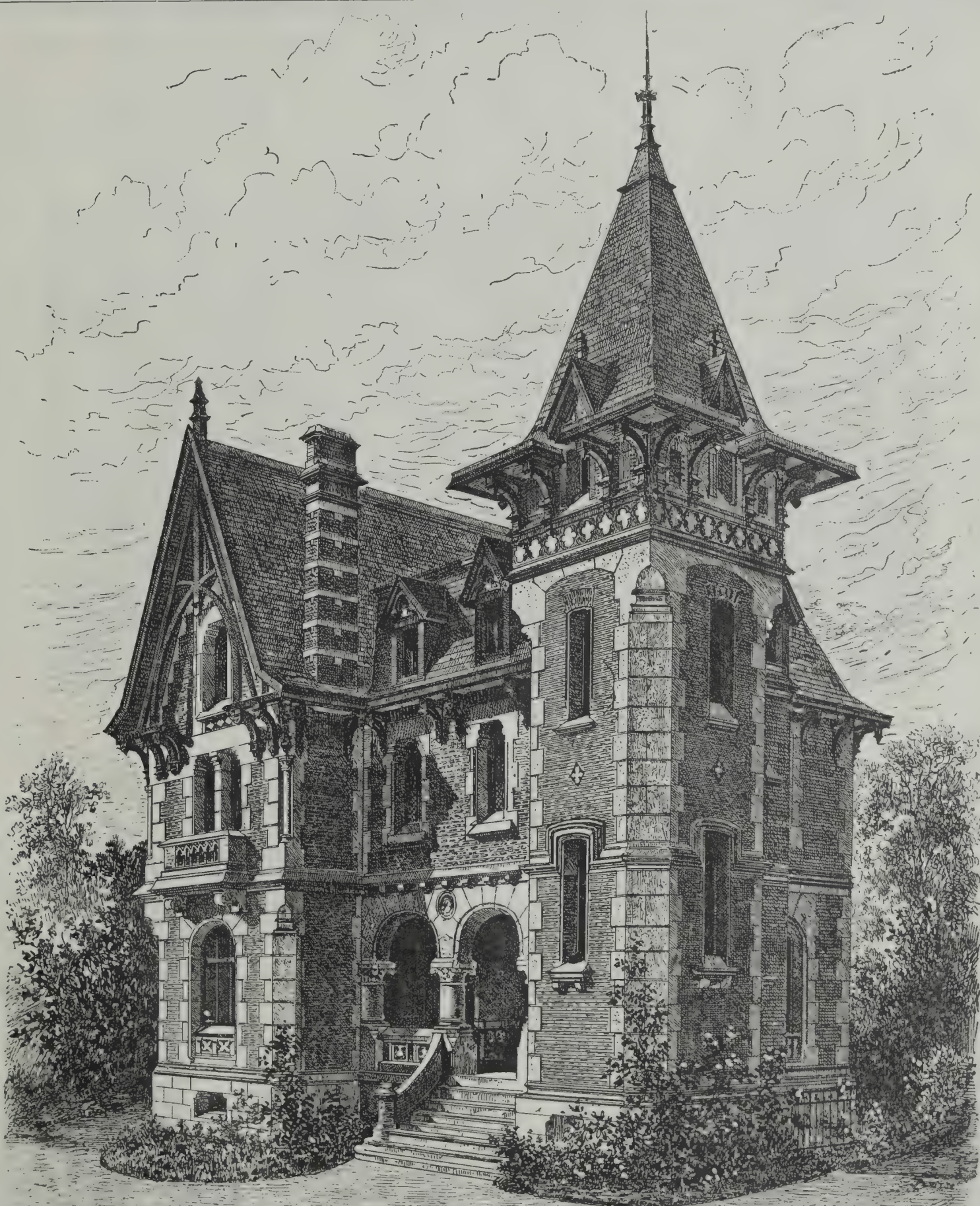
QUICKSAND is composed chiefly of small particles of mica mixed largely with water. The mica is so smooth that the fragments slip upon each other with the greatest facility, so that any heavy body which displaces them will sink and continue to sink until a solid bottom is reached. When particles of sand are jagged and angular, any weight pressing on them will crowd them together until they are compacted into a solid mass. A sand composed of mica or soapstone when sufficiently mixed with water seems incapable of such consolidation.



FIRST FLOOR.



SECOND FLOOR.



A. PEROUX

VILLA AT FONTAINEBLEAU—M. E. BRUNNARIUS, ARCHITECT.





## THE HOME OF SHAKESPEARE.

The first visit is naturally paid to the poet's birth-place—that house in Henley Street which has undergone such vicissitudes to be at last preserved as a national monument. It has been, of course, renovated,

ately in love. The picturesque old building known as Anne Hathaway's cottage in the village of Shottery is only a little more than a mile from Stratford.

A license from the Consistorial Court, at Worcester, for the marriage of William Shakespeare and Anne

as seen from the river on the bank of which it stands. There are many interesting monuments in the church.

The windows of the aisles belong to the fourteenth century. The chancel and choir are remarkable for their fine height and simplicity. Five exceedingly



HOUSE AT STRATFORD ON AVON IN WHICH SHAKESPEARE WAS BORN—APRIL 23, 1564—AS NOW RESTORED.



ANNE HATHAWAY'S COTTAGE, NEAR STRATFORD.

but with something of the judicious care that leaves its earlier features unchanged. The chief apartment is still the room in which the poet was born, and it is reached by a flight of ten stairs of solid oak. The whitewashed walls, the ceiling, the sixty small, square panes of the window, all filled with the autographs of distinguished and undistinguished visitors.

The names of Tennyson and Rogers are on the wall, to the right of the entrance, and lower down those of Dickens, Mark Lemon, and Augustus Egg. Thackeray is on the ceiling, Walter Scott, scored with a diamond, on the window, scribbled over by some obtrusive nobody. The names of the actors cluster about the fireplace, Edmund Kean, Charles Kean, Helen Faucit, Vestris, Buckstone, Mrs. Fitz-William, Robert Elliston, Gustavus Brooke, Charles Mathews, and others, with that of Albert Smith among them.

The parish of Stratford itself lies in a valley which includes eleven villages and hamlets, among them being Bishopston, Little Wilmeote, Drayton, and Shottery. In the latter, in a substantial and comfortable yeoman's cottage in those days, lived the Hathaways, belonging to a very old family of the district, and there, it has always been believed, lived the Anne Hathaway whose beauty seems to have been acknowledged and with whom the youthful William Shakespeare fell passion-

Hathaway after once asking of the banns was issued, dated November 28, in the 25th year of Elizabeth (1583), and the wedding ceremony took place in Trinity Church.

In 1586 he set out for London, and began to attain to

effective windows rise to the roof on either side, one of these the American memorial. This latest the most suggestive and, we might say, the most encouraging token of reverence and infinite regard to the poet of every age and of all time, the memorial window pre-

sented by American visitors, and unveiled in the first week of May, 1885.

This window, which was executed by Messrs. James Westlake & Co., of London, and cost £224, was suggested by Mr. Henry Graves, and the work was put in hand by the late Dr. Collis, in 1874. It represents Shakespeare's "Seven Ages," illustrated by subjects from Holy Scripture: Infancy, by Moses in the bulrushes; Youth, by Samuel before Eli; Manhood, by Isaac and Rebekah; the Soldier, by Joshua leading the armies of Israel; Wisdom, by the judgment of Solomon;

the Philosopher, by Abraham and the angels; and Old Age, by Isaac blessing Jacob.

Against the north wall of the church is the monumental bust of Shakespeare, the work of Gerard John-



TRINITY CHURCH, STRATFORD ON AVON, WHERE SHAKESPEARE IS BURIED.

some position as soon as there was opportunity for his genius to be manifested. He became a shareholder in two theaters, and it is pretty certain that soon after, if not before, 1591, his poetic and dramatic ability began to excite attention.

His plays and sonnets were known and eulogized, his association with the theaters, the Globe and Blackfriars, and the "Curtain" where his plays were doubtless performed, being that of an actor as well as of a great dramatist, and probably in both capacities, but chiefly as author, he was known and appreciated by the queen and in the court, where he ranked some of the nobles among his friends.

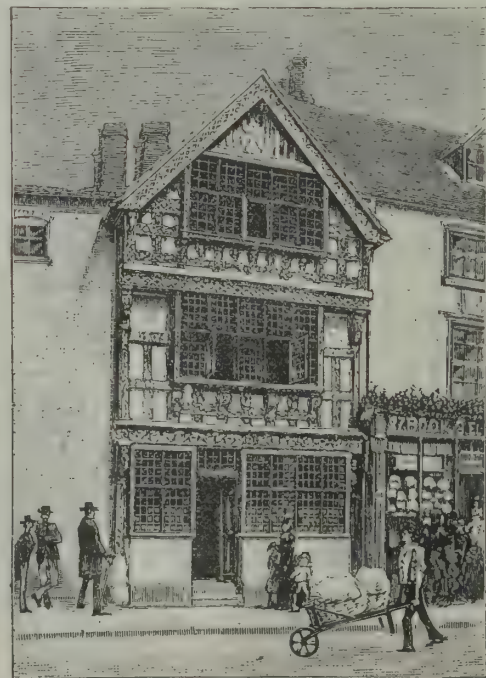
In 1613 he seems to have terminated his connection with the theaters, so far as any personal attendance was concerned, and in that year the Globe, at Bankside, was burned down during the performance of his new play, Henry VIII.

On the 23d of April, 1616, on the anniversary of his alleged birthday, and within one month of signing his will, in which he described himself to be in perfect health and memory, he departed this life, and all that was mortal of him was laid in that tomb in the church which thenceforward became a shrine.

The church at Stratford upon Avon is itself a fine and imposing structure, with much of the appearance of a cathedral, its transept, nave, aisles, and chancel containing some very beautiful work. The bold architecture gives a fine appearance to the exterior building with its tower and steeple



COTTAGE AT WILMEOTE, NEAR STRATFORD, THE RESIDENCE OF MARY ARDEN THE MOTHER OF SHAKESPEARE.



OLD ELIZABETHAN HOUSE, HIGH STREET, STRATFORD, SHOWING THE DOMESTIC ARCHITECTURE OF THE TIME OF SHAKESPEARE.



son, "the Hollander," and Shakespeare's contemporary. It was erected previous to 1623.

The bust, which is life size, was formed out of a block of soft stone, and was originally, or at all events very early, painted in natural color, the hair and beard auburn or warm chestnut, the eyes hazel. The doublet or coat was scarlet, and covered with a loose, seamless black gown. The upper half of the cushion was green, the under part crimson, and the tassels gilt. But, in 1793, Malone, the famous Shakespearean commentator, took it into his head to have the whole bust painted white, and pretty thickly, too, so that much of the original character and expression was obliterated.

The famous bust is likely to remain the most familiar and authentic memorial of the great poet, except his own glorious and immortal works.

#### Beauty of the Larch.

The merits of the larch as an ornamental tree are not often alluded to, yet it is capable of producing an extremely picturesque effect in the landscape, particularly in hilly districts. An old French writer says: "The larch is admired for its pyramidal shape and spiry head, for the tender green and peculiar disposition of its foliage, and for its tassell-like catkins, which spread over the tree, and, seen at a little distance, resemble wood strawberries in their form, color, and size, contrasting pleasingly with the pale green of the beautiful tufts of leaves which crown the slender branches." On the other hand, Gilpin, who is generally acknowledged as an authority as regards the aspect of trees, considers it too formal in growth to be beautiful in this country, though he admits it is elegant. This writer probably regarded it only as a formal tree, when seen, as it generally is, crowded in plantations with a view to profit. I am more concerned at present with its aspect as a lawn or park tree, and in such places it is, I consider, a most beautiful tree, particularly at the age between the juvenile and adult stages. At this age, if the tree has been merely sheltered, not crowded, it is feathered almost to the ground with branches. Wordsworth, who held a high opinion of the larch as an ornamental tree, says: "To produce an ornamental larch, it should be carefully nursed, removing the nurses gradually so as to allow sufficient air around the specimen to encourage the growth of the lower branches, but at the same time affording shelter enough to produce length of stem." He continues: "I do not know a more beautiful object on a lawn in the early summer months than a tree so treated, forming, as it does, a delicate pea green cone from the grass upward to a height of 50 feet or even 60 feet. If properly managed, the lowest branches will live as long as the tree. Then, again, its death-like character in the winter is strikingly peculiar to the tree." In many places in this country I have seen larches which fully justify Wordsworth's remarks, and even some old trees I have seen with branches sweeping the ground.

So much for the ornamental character of the common larch, so common, indeed, that it is looked upon as a native. But beautiful as it undoubtedly is, its near ally from the other side of the Atlantic is even more beautiful. In the American larch we have a naturally weeping or pendulous tree, not an accidental sport or monstrosity, as the majority of so-called weeping trees are, but one that embodies all the elegance of the young deodar with the addition of being deciduous,

which enhances its interest and beauty so much. It is generally admitted that the American larch is handsomer than the European; and, moreover, possesses wood superior for lightness, strength, and durability. But it is not its utility which now concerns us. The branches being longer and more slender, and its leaves being shorter, all add to its distinctiveness. Therefore, in places where the common larch abounds in plantations, this one may be planted on the lawn or in the park for the sake of variety. It is of undoubted hardiness, as it inhabits the coldest, swampy districts from New England northward. It is known popularly as the black larch, American larch, tamarack, and hackmatack, and botanically by several names, the

walk some 10 feet wide for a distance of 130 feet. It is so recumbent in growth that a strong support to the branches is necessary, so as to keep the path clear beneath. There are other varieties of weeping larch which grow taller; among these are the Godsall larch and Lawson's pendulous larch, the latter somewhat resembling the American larch.—X., in *The Garden*.

#### Sewage Disposal in Great Britain.

A London correspondent of the *Journal of the American Medical Association* says that there has just been published, as one of the "Professional Papers of the Corps of Royal Engineers," an interesting contribution to the important problem of how to dispose of

the sewage of great towns. The treatment is alleged to occasion at once a chemical change by which the putrescible matter is destroyed as such matter and resolved into innocuous elements, and it is further alleged that this complete annihilation of dangerous products may take place either in the public sewers or in each house without any change in the existing system of drainage and at trivial expense. The discovery is based upon the well known fact that water filtered through finely divided iron is purified. On the basis of these facts there was carried out a series of experiments whose result is the present discovery. There is produced by various chemical processes a liquid solution of iron of fixed strength. This iron liquor is introduced into the sewage in a quantity proportionate to the amount of putrescible matters believed to be present there, and the assertion is that it immediately resolves these matters into their elements and that the fluid in the drain becomes clear water. For the purification of sewers the plan adopted is to place the iron liquor in a perforated porcelain cylinder, which is placed in a tank that receives a regulated supply of pure water. The iron liquor in the cylinder is taken up by the pure water at a known and easily calculable rate and thus charged with iron; the water escapes by an overflow pipe into the sewer.

In the town of Guilford, a ten gallon tank was fixed and supplied with water from the town water-works at the rate of fifteen gallons per hour. The disinfectant was placed in the tank and an overflow pipe was led from it into the adjacent sewer. The rate of solution was about 1,400 grs. of sulphate per hour. The apparatus was set at work

at 2:40 per hour on November 18, 1885. It was anticipated that several days would elapse before any decided change took place in the purity of the sewage, and samples were taken every twelve hours. On the 19th of November, to the surprise of every one concerned, a clear stream, free from any taint, was seen issuing from the outfall, and the smell had cleared. It is not concluded that this clear water is fit for the purposes that clear water is usually applied to, but it is alleged to be quite innocuous and to effect no perceptible change in the water of the rivers into which it may run. For the application to single houses the process requires only one or more small instruments which the inventor calls ferrometers, containing three pounds of iron solution, whose use can be regulated by simple working parts. The cost of the treatment is said to be very slight as compared to those now in use. Ferrometers have been adopted at Windsor Castle and are stated to be giving entire satisfaction.



THE CHANCEL, HOLY TRINITY CHURCH, STRATFORD ON AVON.—SHOWING THE SHAKESPEARE MEMORIAL BUST AND TABLET, AND THE STAINED GLASS WINDOW, THE GIFT OF AMERICAN VISITORS.

chief being *Larix pendula*, *Pinus pendula*, *Larix americana*, *Abies microcarpa*, and *Larix microcarpa*. The last name is that which generally has precedence among botanists in this country, though nurserymen, as a rule, call it *L. americana*. It is a slender growing tree, throwing off horizontal branches, and often attaining a height of from 70 feet to 90 feet. It is said to be an ungainly-looking tree when old, but in a young state most elegant; the cones are larger and the foliage of a duller hue than that of the European species. It was first introduced to this country about the year 1739 by one Peter Collinson, to whom is accredited the introduction of many fine American trees.

There is a pendulous variety of the European larch in cultivation in this country, originally introduced from the Tyrol. In this form the branches are drooping. It is, however, rarely met with as a large tree, the finest being, it is said, at Henham Hall, in Suffolk. This tree is only about 12 feet high, though it covers a



## ORCHIDS.

W. H. GOWER.

The increasing love for orchids which is daily gaining ground, not only in England, but also in America and on the Continent of Europe, is causing the opening of fresh nurseries for the sale of these plants, and I was somewhat surprised to find in the course of my rambles a new establishment of this kind, Mr. Seager's, in Lordship Lane, Dulwich. This, although only established a few months ago, contains a goodly number of plants, some of them rarities, and also many things in flower. At the time of my visit some of these were being packed for the Continent. Among plants in flower



RODRIGUEZIA RECURVA.

were numerous forms of that general favorite, *Dendrobium Wardianum*, also *D. crassinode*, which, although the flowers are smaller, is little inferior to *D. Wardianum*. There was also blooming the darkest variety of the long-tailed lady's slipper (*Cypripedium caudatum*) I have ever seen, together with numerous other forms of this now popular genus, including a beautiful variety of the hybrid *C. vernixium*, bearing more spotted flowers than usual, and an abundance of promising-looking seedlings. A fine batch of *Rodriguezia secunda*, recently imported, and many of them blooming, also disclosed the fact that *Ionopsis paniculata* grows naturally with the *Rodriguezia*, as the two plants appeared to be so interlaced as to be almost inseparable. *Rodriguezia recurva*, of which we give an illustration, is another very pretty but much neglected species. Here, also, were large quantities of *Cattleya bicolor*, some of them flowering, and from the brilliancy of the lip in some forms they were a good selection, and likely to further the increasing love for this old

species, which, by the way, appears to enjoy a greater amount of heat than the majority of *Cattleyas*.

Another old favorite blooming here is *Bletia verucunda*, a terrestrial genus of orchids, which is likely to again come into favor. This is a genus upon which I recently made a few remarks, and this species was inadvertently omitted by me in that enumeration. A very fine form of *Masdevallia Veitchei superba* was also flowering, and was remarkable for the great amount of color in the upper sepals. This species appears to thrive best in a somewhat warmer temperature than the majority of the other kinds. Here also were many plants of *Odontoglossum Alexandræ*, which have been grown very cool, and which are very remarkable for their sturdy vigor. Another extremely rare plant which I noted was *Lælia Stelzneriana*. It belongs to the elegans section, having a very rich purple lip; the plants appear to have been recently received, and are somewhat shriveled. *Goodyera pubescens* is another old favorite, now much neglected, but a beautiful ornamental leaved orchid, which thrives well with the *Odontoglossums*, its green leaves, reticulated with white, rendering it no mean ornament to a cool stove. —*The Garden*.

## Test of Fireproof Wire Lathing.

A special train from Broad Street station lately took out to Germantown Junction a large number of architects, builders, insurance men, and parties connected with the iron and steel trade, to witness a comparative test of the durability under fire of the ordinary wooden lathing, now generally used, and the fireproof patent stiffened wire lathing of the New Jersey Wire Cloth Company. A substantial two-story brick structure, about 8 by 12 feet in size, had been erected, with a stout dividing wall in the center, making two compartments. One apartment had its ceiling of wooden laths, nailed to joists and plastered over, and the other of wire cloth, upon which the plaster had been spread. A hot fire was built in each compartment after everybody interested had an opportunity to inspect the preparations by going up a ladder to the top of the structure, upon which no roof had been placed, the better to subsequently compare results. At the end of ten minutes, when the fire was extinguished, the wooden lathing had burned away, the plaster had fallen into the ashes beneath, and the joists became charred from the flames. In the other compartment, where the wire cloth was used, it and the plaster remained intact at the end of that time, as it did over an hour afterward, when the fire there had been allowed to burn out. The test seemed to meet the general approval of the spectators, who commended the use of the wire lathing in buildings intended to be fireproof, or, at least, slow-burning. —*Iron Age*.

## A CLEMATIS PORCH.

The clematis *Miss Bateman*, one of the prettiest of hardy climbers, is well shown in the engraving we give, which is from a photograph of a plant on the porch of a cottage in the grounds of Mr. W. H. Tillett, at Sprowston, near Norwich. It is one of the spring flowering varieties, blooming at the end of May and in June. Its flowers are large and of a good white, with stamens of a reddish plum color, the contrast being very pleasing. There is a pale green bar down the center of each petal, but it is almost invisible, and in no way detracts from the charm of the flowers. For such a situation as that in which it is shown in our engraving, it is one of the most attractive of plants. —*The Garden*.

IN connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

## SOME WAYS OF USING THE VIRGINIA CREEPER.

One thing decidedly in favor of the Virginia creeper (*Ampelopsis quinquefolia*) as a popular plant is that it thrives to perfection with the most ordinary kind of culture. It requires no petting or nursing. Unlike many things of like easy growth, it never assumes the character of a troublesome weed. It is, in fact, the ideal climber for draping buildings, arbors, walls, fences, posts, stumps, etc., with handsome verdure. The pity is that such a useful, handsome, hardy



Fig. 1.—GATE POSTS AND FENCE COVERED WITH VIRGINIA CREEPER.

vine should not be more widely employed than now by the masses, for the ornamentation of home surroundings.

In this connection we desire to present a few uses to which we have seen this vine put, with such admirable effect that it would be a pleasure to see the methods often applied. Fig. 1 shows an entrance to grounds with the posts and front fence covered with this creeper. In this case the posts were of good size, eighteen by eighteen inches square, with a top yet larger. Any ordinary sized posts could be built out to thus support the vines for forming strong pillars of green to flank the entrance of a place. For the sake of economy in material, even rough, unpainted boards would answer, as after the first or second season it would be completely covered from view. The fence in this case consisted of a lattice work of wire, but something yet cheaper than this would answer for giving it body. Such an inclosure to the grounds would be as ornamental



Fig. 2.—FENCE AND GARDEN ARBOR CLOTHED IN GREEN.

as a hedge, in some respects more so, and there would never be the trouble of spots appearing, through the failure of the growth, as this vine knows hardly any such thing as fail.

Fig. 2 represents a garden fence somewhat similar to that of the first engraving, but with a most delightful arbor of green extending out from and covering a seat at the termination of one of the garden walks. In constructing the framework of such an affair, it matters but little for appearances whether the material be wood or metal, so long as a form of good shape as to general outline is obtained. Of course metal would, for the lighter parts, be the most durable.

Fig. 3 shows an exceedingly graceful and pleasing division mark for between various parts of the garden, as between the ornamental, vegetable, or fruit part. The construction of the supporting part is very simple. It consists merely of low cedar posts set at eight or ten feet apart along the division line, with a chain or



Fig. 3.—A NEAT DIVISION MARK.

twisted wire extending from end to end through holes near the tops of the posts, and to droop slightly between the posts. Another wire should extend similarly from post to post, but in this case fixed and to be six inches from the ground. By then planting one strong root of the *Ampelopsis* on each side of each post in rich soil, the entire support should soon be covered with the vine.

While the Virginia creeper will bear ill usage as well as any other plant that grows, it responds quickly to liberal culture. If, therefore, the grower would have the handsomest results very shortly after planting, he should see to it that the ground is made decidedly rich and stirred up to a good depth wherever a plant is set. —*Popular Gardening*.

DRY ROT.—It is said that "dry rot" in timber is contagious, and can be carried by saws and other tools which have been in contact with infected wood, and thus vitiate sound timber such tools afterward come in contact with.



CLEMATIS OVER PORCH.



A SUBURBAN VILLA.

On Sound View Hill, overlooking Long Island Sound, near New York, is this attractive villa, which has been lately built by Mr. Curtis.

The house is very attractive, having a very pleasing elevation, a beautiful roof of the old colonial type, numerous bays, balconies, and a tower on the main side, in all giving it a very pleasing appearance. The

rooms are large and airy, containing all the modern improvements.

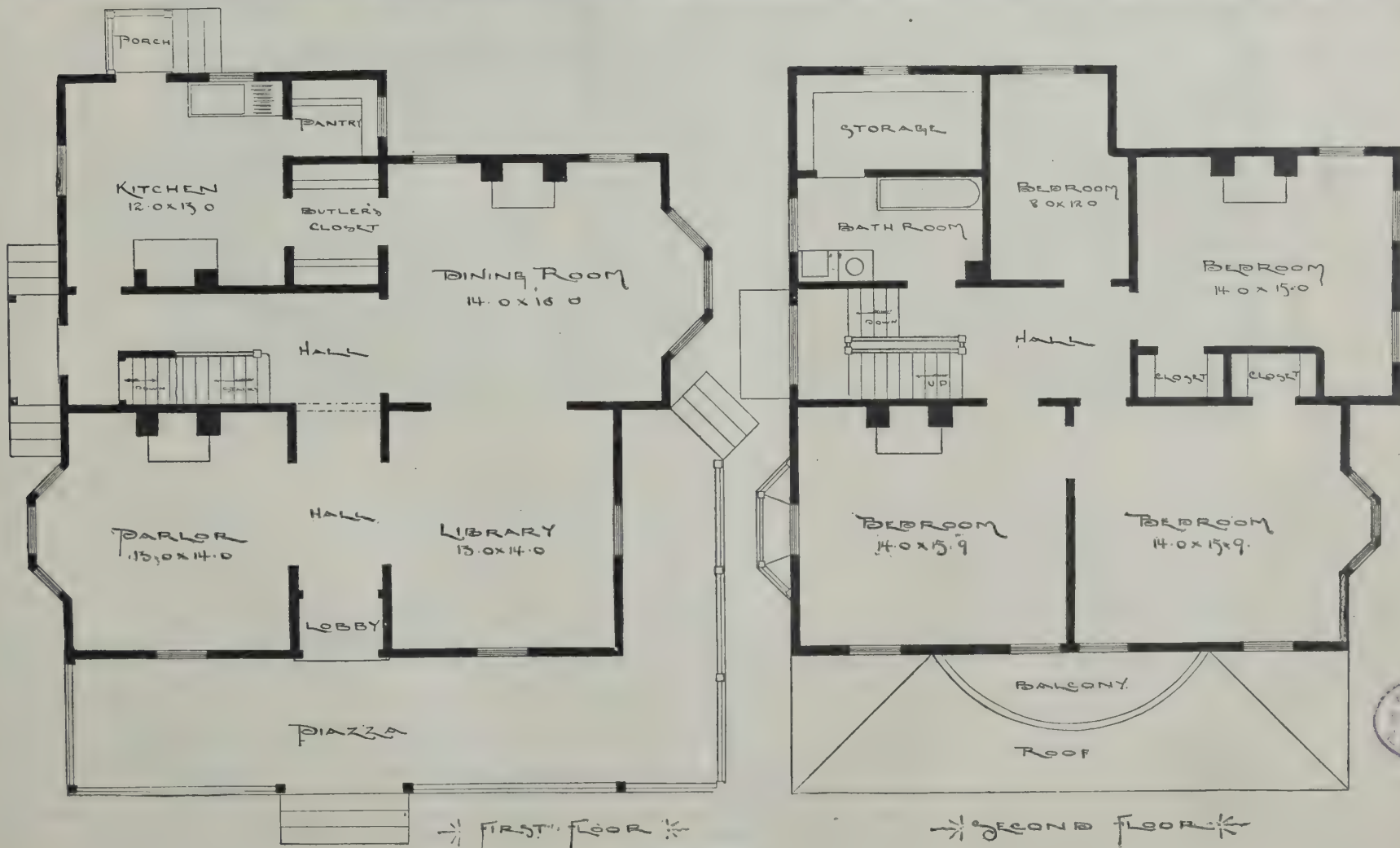
There is a cemented cellar, with coal, wood, and furnace rooms, a laundry provided with wash trays supplied with hot and cold water.

On first floor is a large hall, parlor, library, dining room, kitchen, pantry, and butler's pantry, the two latter being fitted up complete with drawers, shelves,

and closets. A piazza across front and returns at side; also a side porch.

Ascending an easy staircase, with one landing, having a splendid art glass window, we come to the second floor, which has three large bedrooms, with closets complete, a hall bedroom, bath room provided with all the requisites, and a store room with shelves.

The attic contains two bedrooms, a billiard room,



A SUBURBAN VILLA.



and trunk room. The inside trim throughout is of cherry, finished in a dead gloss. The casings to doors and windows are beaded and band moulded.

The kitchen is finished in North Carolina pine, and is wainscoted with similar wood in narrow widths, beaded.

The bath room and pantries have a similar finish.

The staircase is of cherry, with handsomely carved newels, balusters and rail.

The parlor, dining room, and two bedrooms have open fireplaces, with brass dog irons and tile hearths.

The mantels are very handsome, having glass mirrors and carved panels

The ceilings are neatly corniced.

The house is piped for gas.

Our perspective is from a photograph taken direct from the house for the SCIENTIFIC AMERICAN.

The house cost \$5,800, but can be easily built for about \$5,200.

Feeding Coal to the Fire.

The throwing of fuel upon the fire is generally considered as a means of augmenting the amount of heat

of the solid carbons, did not have to heat these gases, it would give out just that same amount of heat that would be available for steam making.

It is due to this fact that coke has been accredited with greater heating properties than bituminous coal, simply because the gases in the coal have been distilled and not burned. But when the furnaces are so designed that these gases are thoroughly burned, the heating properties of the coal will be found to be greater by just the amount of heat given out by the combustion of the gases in excess of what was required to distill them.—*Amer. Jour. of Railway Appliances.*

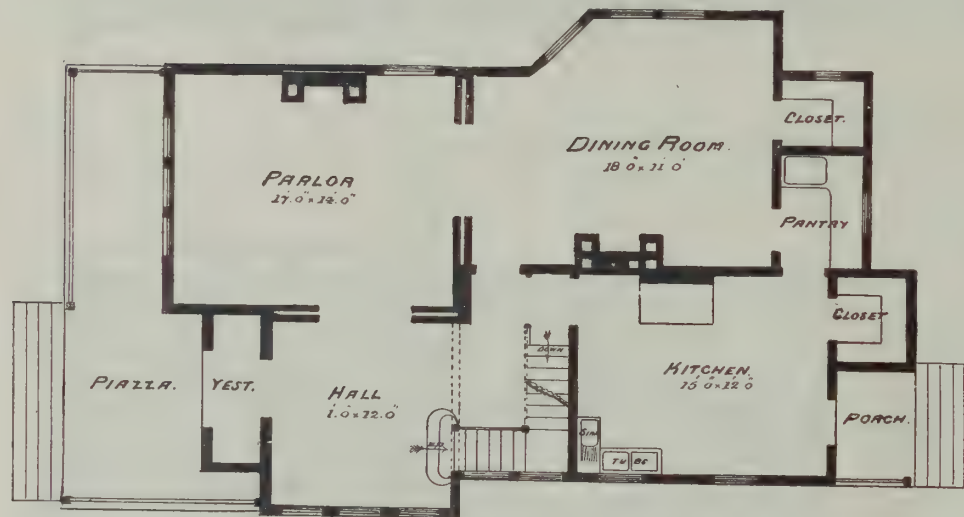
A COTTAGE OF MODERATE COST.

We give a design for a cottage by S. W. Whittemore, architect, Brick Church, N. J. It has a front of 30' 9"; side, 45' 3", not including piazza. For dimensions of rooms, see floor plans. Height of cellar, 7'; first story, 9' 6"; second story, 9'; attic, 8'.

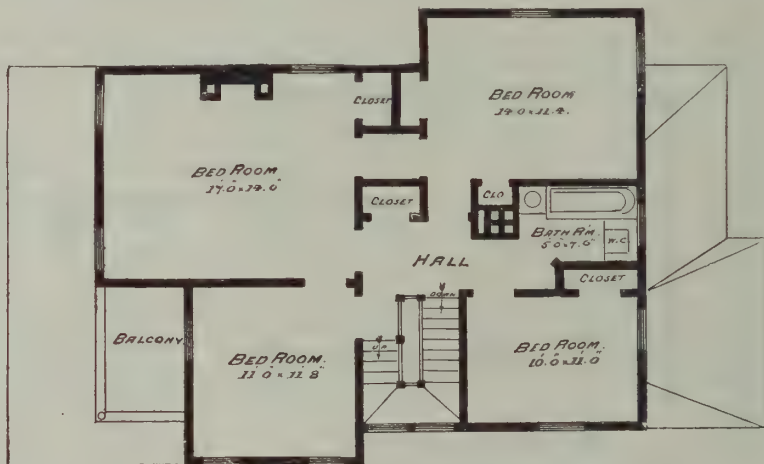
Foundation.—Stone to top of ground; balance, brick. First story, clapboards; second story, clapboards; gables, shingles; roof, slate. Cost, without furnace and mantels, \$3,500.

erty of rendering wood unflammable. It must not involve an expense out of proportion with the purpose to which the wood is applied, nor should the process be such as to delay the rapid execution of the work, nor should the substance employed be liable to attack any metal parts which it may become necessary to use with the wood. The process should also be of easy application—with a brush, for instance, the only manner in which it can be applied to existing structures. The wood thus coated should present a neat, tidy appearance, and should also be capable of receiving a coat of ordinary paint over the fire proofing composition; nor should one or the other coat be subject to alteration after a moderate lapse of time.

It follows from the above considerations that wood cannot be rendered incombustible, or, more strictly speaking, non-alterable, by heat; but its non-flammability may, to a considerable extent, be insured, so as to preserve buildings from a limited and temporary fire—at any rate, until assistance arrives. The methods of preserving wood against fire are of two kinds—the injection of saline solutions and the application of a paint or coating. The former appears but little prac-



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

A COTTAGE OF MODERATE COST.

produced, and taken as a whole it does have that effect. But for the maintenance of a steady fire and an even heat, only a small amount of fuel should be thrown upon the fire at a time. The reason for this is that coal is dependent upon two constituents for its heat-giving properties. One of these, the carbonaceous, remains in a solid state, while the other, the bituminous, is volatilized. As the latter process must be accomplished before the first will be ready for burning, the first effect of throwing fuel upon the fire is that of cooling. Not only must the solid coal be raised to the furnace temperature, but the volatilization must be carried on.

Here the same laws come into play as in the evaporation of water. The evaporation and the volatilization require more heat than that accounted for in the elevation of temperature, and which is therefore rendered latent. Hence unless care is taken to burn these gases as they are given off, it would be better that they did not exist. For it will be readily understood that if the fire, which is due to the combustion

There is a large reception hall, with platform, stairs in rear of hall; parlor, dining room and hall connected with sliding doors; open fireplaces in parlor, dining room, and one chamber; two chambers connecting; ample closet room throughout.

Wood that will not Blaze.

At the request of the Belgian Minister of Public Works, says the *Journal of the Society of Arts*, M. Boudin and M. Donny, professors at the Ghent University, have conducted a series of experiments and investigations in connection with rendering wood inflammable. The following resume embodies the conclusions at which they have arrived:

Although wood cannot practically be rendered so fire proof as not to be destroyed by heat, it is possible to deprive it, to a considerable extent, of the property of catching and communicating fire, and to this end it is sufficient to coat the wood with a suitable composition. It is not, however, sufficient that this composition or substance possesses in a high degree the pro-

tical. In the majority of cases, coating with the brush is the only practical solution of the question, and the substances most to be recommended for use in this manner are cyanide of potassium and asbestos paint.

Fall of a Stone Church Tower.

The stone tower of one of the finest churches in course of erection in Washington, that of the Church of the Covenant, at the intersection of Connecticut Avenue and N Street, fell down at an early hour on the morning of Aug. 22 last. A portion of the main roof of the church was torn out at the same time. Fortunately no life was lost, the catastrophe having been expected for some time. The fall appears to be due to the indifference of the builder and the neglect of the trustees, who permitted the building of an enormous structure of solid stone, 158 feet in height, to go on after cracks in the side walls and in the foundation had been discovered more than two months ago.

Heavy rains undoubtedly contributed to the final wreck of the tower. The chief defect seems to have



been a layer of Ohio sandstone near the base of the structure, which was unable to withstand the enormous weight of the tower above. It crumbled to pieces, as stone after stone was added. J. C. Cady & Co., of New York, were the architects.

The colored watchman was the only witness of the catastrophe. He was standing on the opposite corner of the street shortly before 5 o'clock. He felt, he says, that the tower was going to fall. It had been cracking and settling all the evening. He was, therefore, on the watch, and spent the greater part of the night in the street. Just before the tower fell he says that he saw the west side, a short distance above the doorway, bulge out. Then the stones corresponding on the south face of the tower bent out, the area covered being about six feet. Finally these portions of the tower gave way and fell to the ground, followed by a heavy rush as the great mass of stonework from which the support had suddenly been withdrawn came tumbling to the ground. The earth shook with the force of the concussion and a roar filled the air, then clouds of dust followed. When the dust had disappeared, the stately structure of stone lay in ruins.

#### A Ruined City in Texas.

The surveys at present being made for the Kansas City, El Paso and Mexican Railroad, at a point north latitude 33 degrees and west longitude 106 degrees, have passed along the lava flow which by the local population is called the Molpais. It consists of a sea of molten black glass, agitated at the moment of cooling in ragged waves of fantastic shapes. These lava waves or ridges are from ten to twelve feet high, with combing crests. This lava flow is about forty miles long from northeast to southwest and from one to ten miles wide. For miles on all sides the country is the most desolate that can be imagined. It has been literally burned up. It consists of fine white ashes to any depth which, so far, has been dug down. To the north of the lava flow, and lying in a country equally desolate and arid, the surveyors have come upon the ruins of Gran Guivera, known already to the early Spanish explorers, but which have been visited by white men less often even than the mysterious ruins of Palenque in Central America. Only a few people at Socorro and White Oaks have been at Gran Guivera, because it is at present forty miles from water. The surveyors found the ruins to be of gigantic stone buildings made in the most substantial manner and of grand proportions. One of them was four acres in extent. All indications around the ruins point to the existence here at one time of dense population. No legend of any kind exists as to how this great city was destroyed or when it was abandoned. One of the engineers attached to the surveying expedition advances the theory that Gran Guivera was in existence and abundantly

supplied with water at the time the terrific volcanic eruption took place.—*Engineering and Mining Journal*.

#### A QUEEN ANNE COTTAGE IN ROCHELLE PARK.

Our illustration shows a Queen Anne cottage lately erected in Rochelle Park, New Rochelle, N. Y., for Mr. Stiles at a cost of \$5,600.

The house has a well arranged plan, the elevations are attractive, and it is finished with all the modern conveniences.

A cemented cellar under whole of house is provided with coal and wood cellars, a furnace room and steam heater.

This room is finished in cherry, has a neat mantel and open fireplaces, a tile hearth, etc.

The library is fitted with a fireplace, and artistic book shelves placed here and there.

One large window gives plenty of light.

The dining room is large, finished in cherry, contains an open fireplace, with hearth and mantel, tastefully finished, and two windows run down to floors and open on to a pretty balcony.

Kitchen, pantries and bath room are wainscoted with narrow beaded stuff, finished with a neat cap.

The kitchen is fitted up in the best manner with wash trays and sink, neatly cased up with closets under same, supplied with hot and cold water.

The bedrooms are all good size, finished in white-wood, and provided with ample closets.

The front guest chamber has a neat mantel and open fireplace.

The bath room is neatly fitted with tub, wash bowl, and water closet; hot and cold water, etc.

The posts, rails and balusters to rear and attic stairs are neatly turned.

There are two rooms neatly finished in attic, besides a trunk room.

The interior is finished in the natural wood.

The exterior, from top of underpinning to the extreme point of roof, is painted in an Indian red.

The house is built in a first-class manner in every respect.

Our engraving was prepared from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

#### Loofah.

The *Borsen-zeitung* directs attention to the growing use of loofah as a substitute for sponge. This curious substance is the skeleton-like, fibrous covering of a species of cucumber which grows in tropical climates. It is believed that the proprietors of the extensive loofah works at Halle were the first to recognize its value as an adjunct of the bath, and to make of it an



A QUEEN ANNE COTTAGE IN ROCHELLE PARK.

Foundation of stone, underpinning and chimneys of brick.

The rest of the house is of wood.

The first story is clapboarded, the second and roof shingled.

To the left of hall as you enter is an open fireplace, fitted with tile hearth and an artistic mantel in cherry.

To the right is a very handsome staircase, with neatly turned newels, posts, balusters and rail of cherry; on ascending three steps is a broad landing, with a seat and a pleasant window. This makes a quiet little nook.

The rest of woodwork in hall is of cherry.

The other rooms on this floor are parlor, library, dining room, kitchen, and pantries.

The parlor is a very pretty room, well proportioned, having an octagonal projection, giving a very pleasing effect to the interior and adding a noticeable feature to the exterior.

article of commerce. Certainly by their enterprise they have created a considerable industry in collecting, preparing, and converting it for use. Enormous quantities are exported from Halle to all the principal markets of the world, England being an important customer. A large quantity is now manufactured into inside soles for shoes. The latest development of the trade is to apply it to the under side of saddles, its principal merit in the application being that it tends to keep the horse's back cool.

FULL plans, specifications, and details ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York. Plans for the alteration and enlargement or improvement of buildings are also supplied.





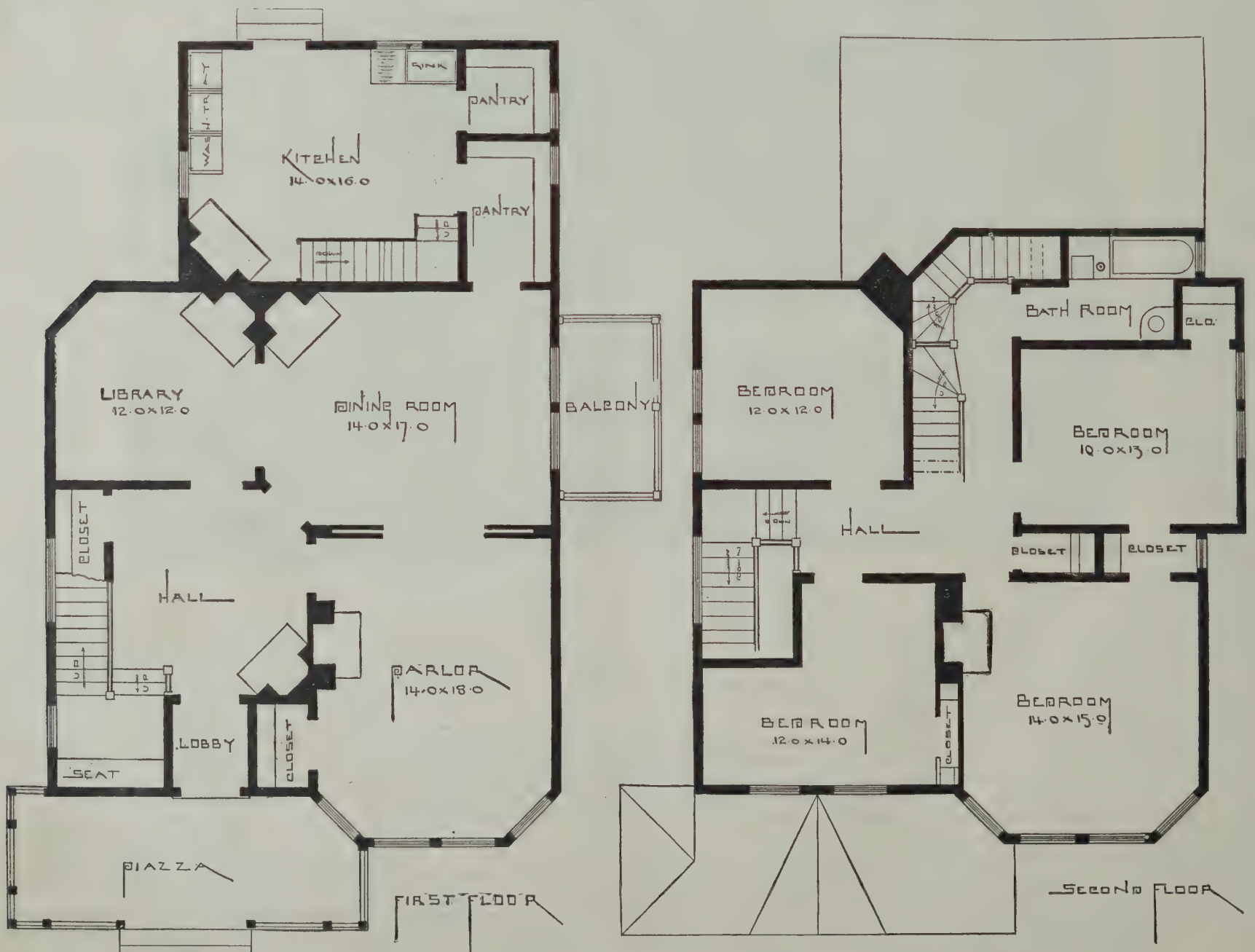
AN ENGLISH DOUBLE HOUSE OF MODERATE COST.

AN ENGLISH DOUBLE HOUSE.

These houses, which have been recently completed at Methley, for Mr. T. Braine, give on the ground floor two sitting rooms, hall, kitchen, with cellars in base-

ment, and on first floor three bedrooms, landing, and bathroom. In the rear of the houses are placed wash houses and offices. The walls are of red brick, with stone dressings and timber gables.

They have been completed in a most substantial manner, at a cost of \$3,400, by Mr. P. Rhodes, of Leeds, from the designs of Mr. T. Butler Wilson.—*The Architect.*



PLANS OF QUEEN ANNE COTTAGE.—[See page 81.]







Two Economical Cottages.













DESIGN FOR THE DUQUESNE CLUB HOUSE.

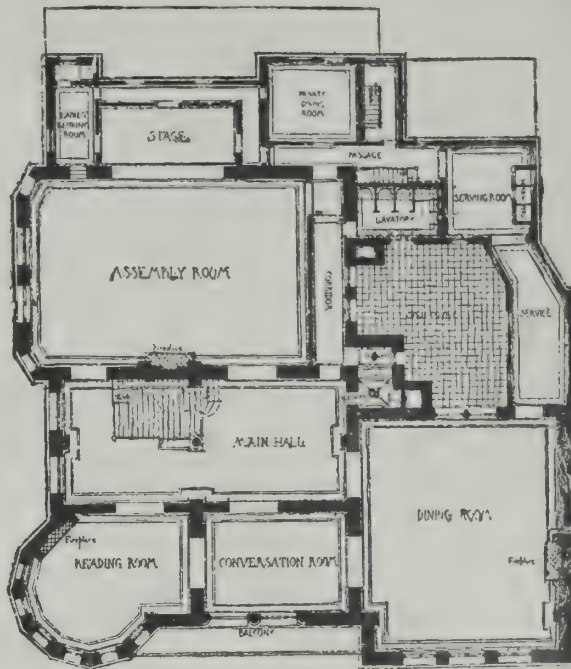
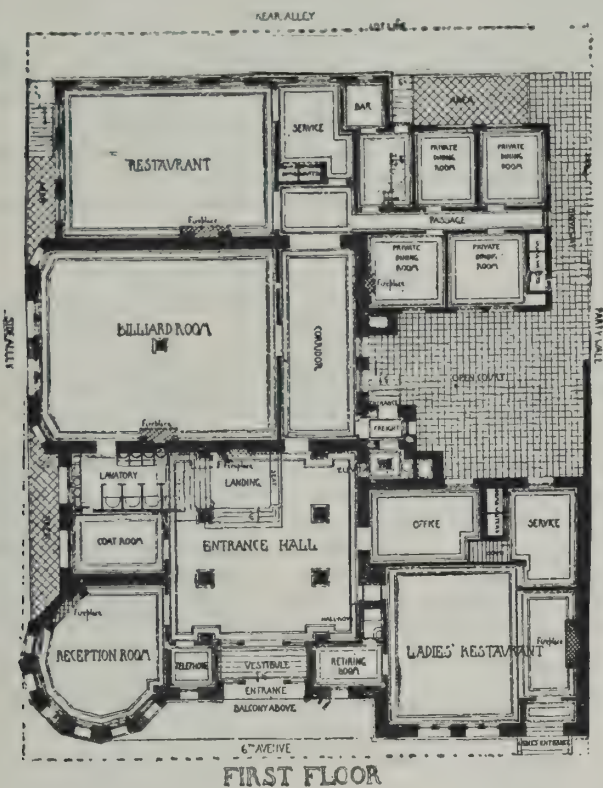
We present herewith an attractive design for a club house, by Heins & La Farge, architects, New York. This design is one of a series in a competition. We are indebted for our sketches to a recent number of *Building*.

A California Farm.

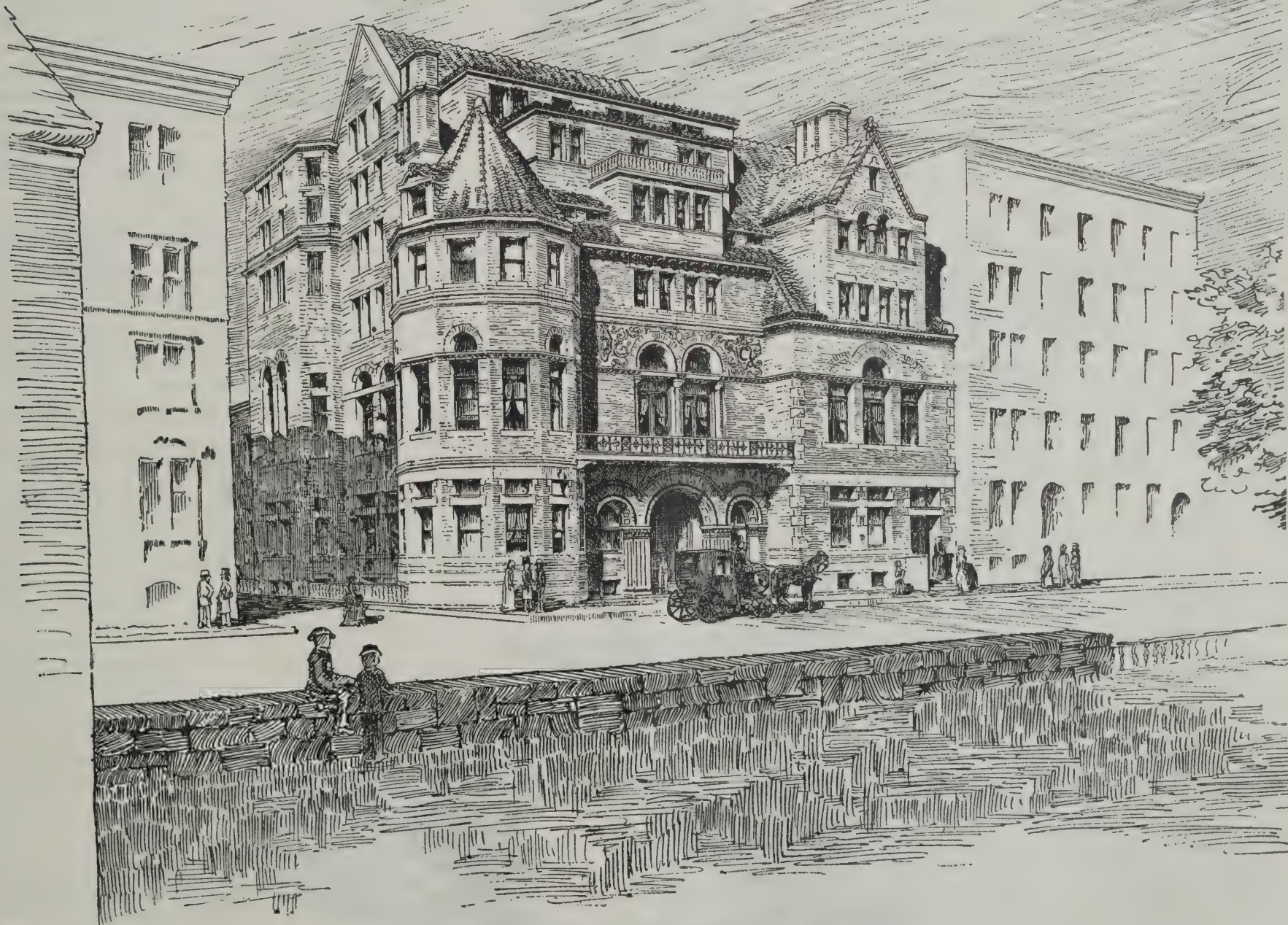
Dr. C. C. Parry, the distinguished botanical explorer, contributes to the June number of the *Overland*

regions in the State. "The fig and the olive, the native walnut and its Asiatic relative, flourish in unrestrained luxuriance. There is no other section in which the cherry bears more plentifully or with greater certainty of return." One tree in the orchard produced last year nearly a ton of fruit, which sold for an average of ten cents a pound, making nearly two hundred dollars as the return for a single tree in one season. "In May the apricot begins to yield its golden fruit, and before its day is passed, apples, pears, peaches, plums,

some idea of its fertility and of the extent to which it is cultivated will be gained from the following enumeration of the average crops which it produces: 100,000 bushels of wheat and 50,000 bushels of barley; 1,000 tons of hay; the meat product requires the slaughter of 300 cattle and 1,200 sheep; a dairy of 150 cows produces a gross income of \$1,000 a month. The cannery turns out 370,000 two-pound cans of fruit, not including great quantities of dried orchard fruits. During the height of the fruit season, more than 500 persons find employ-



SECOND FLOOR



DESIGN FOR THE DUQUESNE CLUB HOUSE.

*Monthly* (also issued separately) an interesting account of Rancho Chico, General John Bidwell's California ranch, on the lower Sacramento, near the site of the historical Sutter's fort. It has long been known as one of the best and most productive farms of the Pacific slope, abounding in features of natural beauty, and famous for the hospitality of its enlightened proprietor. Dr. Parry describes pleasantly the history and the situation of Rancho Chico, the native plants which adorn it and the crops it is made to bring forth. The ranch is situated in one of the best fruit-producing

almonds, nectarines, prunes, quinces, and the endless variety of grapes come one after another to fill their places in an endless round. Aside from table grapes, all the vineyard product of the ranch is made up into raisins. There is something in the quality of climate and soil that is peculiarly favorable to the culture of the malaga, and the finished product is sweeter than the average and far excels the more famous Fresno bands in the thinness and tenderness of skin."

There are 25,000 acres in General Bidwell's farm, and

ment on the ranch. The most interesting of the numerous illustrations joined to this article is that of a noble specimen of the deciduous white oak of California (*Quercus lobata*), known as the "Sir Joseph Hooker Oak," in honor of the English botanist who visited General Bidwell during his journey in this country in 1877. The photograph from which the illustration is made was taken in winter, and exhibits the graceful pendulous ramification of this tree much more satisfactorily than we remember to have seen it depicted before.—*Garden and Forest*.



**Defects in Plumbing in the Maine Insane Asylum.**

The State Board of Health of Maine reports, in its inspection of the State Insane Asylum, the following conditions existing in the plumbing and drainage:

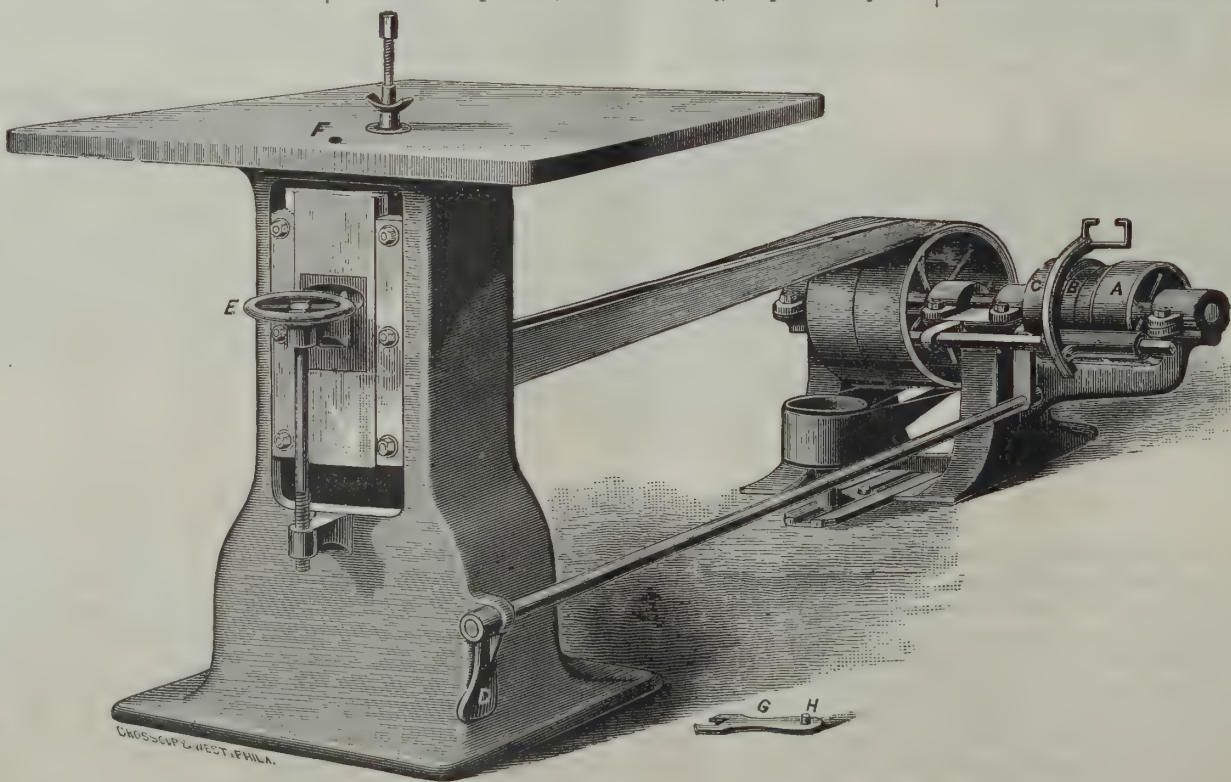
"We were pleased to note within the buildings that there was manifest in the renovation of old and projection of new work an intelligent comprehension of the main principles under which we may largely expect freedom from nuisance and the ills incident to sewer gas. Imperfections in certain minor details were evident, and they were minor only because the rule of placing all pipe lines and fixtures in view, and subject to continual inspection, has been followed. Some of the imperfect joints noted may have been carelessness on the part of the plumber, others were perhaps due to the changing conditions peculiar to most new buildings, others to inherent faults between the principles and the conditions under which they may be maintained. This last refers more particularly to defective leaded joints, generally found in long, nearly horizontal lines of soil pipe, when placed or used in a manner to be subject to wide ranges of temperature. To further explain our meaning: Certain sections of the sewerage system of a large asylum building may be internally flooded alternately with large quantities of hot and cold water, or, as is, perhaps, more prominently the case in the State Insane Hospital, the conditions in a part of the basement have been favorable to sudden wide ranges of external temperature. The direct effect of such conditions upon sewer pipe put together with lead-calked joints is as follows: Heat expands the lead in the hub of the pipe so much more rapidly and extensively than it does the iron, that the lead partly leaves the hub to satisfy the conditions of increased volume, and in so doing it changes its form, so that when contraction takes place its new form is no longer one to make a tight joint. Your committee has observed cases where the daily, almost hourly, wide ranges of internal temperature in pipes has served practically to push the lead calking quite out of the joint. The action was undoubtedly supplemented by the sediment that formed behind the lead, which the lead subsequently pushed against in its next expansion. The above were the conditions that we think account to a certain extent for the defects noted, and we are not prepared to advise methods of remedy, other than frequent inspection and repair by recalking the joints. The defect incident to the wide ranges of external temperature in the basement will, we think, be largely remedied by what Dr. Sanborn has already done, and by his contemplated placing of more heating pipes in the section where the sewer pipes have been so much exposed."

**AN IMPROVED REVERSIBLE SHAPER.**

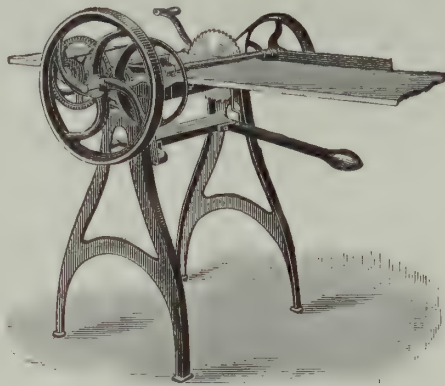
The shaper herewith illustrated differs in many respects from the usual style of shaper, one of the principal advantages claimed for it being its reverse motion, dispensing entirely with one belt, and thereby saving not only the belt, but also a wide-face pulley on the shaft from which the counter of the machine is driven. The spindle is driven with the same effect as with a straight belt from the counter, which is considered a great advantage over the quarter-twist belt generally used, as the belt contact is greater, thus giving more power with the same width of belt. In reversing the motion of the spindle, the horizontal position of the belt as shown in the cut is not affected, nor does the variation of the spindle from one extreme to the other affect it. When this belt becomes too slack, it is only necessary to move the tightener shown in the cut further out to take up this slack, thus admitting of an endless belt being used. There is only one loose pulley, B, on the counter, and, as this is provided with a patent lubricating device, it requires but little attention.

The operation of the reverse motion is to shift the belt from A to C and from C to A. To stop the counter and spindle, the belt should be shifted to B.

The wrench, G H, is used when the cutters are to be put on or removed, when the pin, H, is dropped into the hole, F, in the table, the square end of the wrench engaging with the spindle. This gives the operator the use of both hands to handle the cutters. For further particulars with reference to this machine address Messrs. E. & F. Gleason, 250 Susquehanna Ave., Philadelphia.

**IMPROVED SHAPER OR REVERSIBLE MOULDER FOR WOOD WORKING.****IMPROVED HAND AND FOOT POWER SAWS.**

The difference between machines designed mainly for amusement and recreation and those built for practical and economical work in every day service in the workshop is especially emphasized in the illustrated catalogue of machines recently issued by the W. F. &

**HAND CIRCULAR RIP SAW.**

John Barnes Co., of Rockford, Ill., describing their foot, hand, and steam power machinery. The machines made by this company are principally such as are meant to be used in the workshop, where the kind and amount of work which can be done with them can come into successful competition with that accomplished by any other machinery the purchaser can find. Two such machines are represented in the accompanying illustrations: The hand circular rip saw, designed to rip boards or planks of any thickness up to 3 1/4 inches, being especially adapted for use in shops with-

**COMBINED CIRCULAR SAW AND SCROLL SAW.**

out steam or water power, and, as nearly as possible, take the place of a steam rip saw in quantity and quality of work. The feed can be made fast or slow, and the feed rollers are self-adjusting to thick, thin, or uneven lumber, while the saw can be instantly set to or from the gauge to any width desired. It is claimed that with this machine one man can do the work of three using the old hand saw, while unskilled operators can do the work rapidly and truly, all the work done being true and square, so that it can be easily dressed with the plane.

In the combined scroll saw and circular saw each machine is perfect, neither being impaired by the

other. The two machines can be put in one ready for use either way, in a minute, and the combined machine is furnished at less cost than both can be sold at separately. For light ripping, cutting to length, cutting joints, drawer and box work, etc., the circular saw of the combined machine affords especial advantages, while the machine has several different combinations and attachments adapting it to the general uses of the carpenter, cabinet maker, or almost any woodworker.

SINCE the introduction of exhaust steam for heating purposes, great trouble has been experienced from the oil used in lubricating the cylinder and rods being carried into the boilers with the returns, causing them to prime and working serious injury to the entire inner surface. Hine & Robertson, 47 Cortlandt Street, have a device for removing the oil and water before entering the pipes and radiators, and, we are informed, are sending out a large number with the most gratifying results.

**Practical Hints on Disinfection.**

From "Disease Germs and How to Combat Them," by Lucius Pitkin, in the *Century* for July, accompanied by a frontispiece portrait of Pasteur:

*First.* Corrosive sublimate (mercuric chloride), sulphate of copper, and chloride of lime are among our best disinfectants, the first two being poisonous. At wholesale drug houses in New York single pounds can be obtained, mercuric chloride costing seventy-five cents, the others ten cents a pound.

*Second.* A quarter of a pound of corrosive sublimate and a pound of sulphate of copper in one gallon of water makes a concentrated solution to keep in stock. We will refer to it as "Solution A."

*Third.* For the ordinary disinfecting solution add half a pint of "Solution A" to a gallon of water. This, while costing less than a cent and a half per gallon, is a good strength for general use. Use in about equal quantity in disinfecting choleraic or typhoid fever excreta.

*Fourth.* A four per cent. solution of good chloride of lime or a quarter pint of "Solution A" to a gallon of water is used to wash wood-work floors and wooden furniture after fumigation and ventilation.

*Fifth.* For fumigating with sulphur, three to four pounds should be used to every thousand cubic feet air space. Burn in an old tin basin floating in a tub of water; keep room closed twelve hours, to allow the fumes to penetrate all cracks. Then open a window from the outside and allow fumes to escape into air.

*Sixth.* Soak sheets, etc., in chloride of lime solution, wring out and boil.

*Seventh.* Cesspools, etc., should be well covered on top with a mixture of chloride of lime with ten parts of dry sand.

*Eighth.* Isolate the patient in an upper room from which curtains, carpets, and stuffed furniture have been removed.

*Ninth.* The solution of mercuric chloride must not be placed in metal vessels, since the mercury would plate them.

**The Northwestern Architect and Improvement Record.**

Two editions of this excellent architectural monthly are issued, the regular edition at \$3 a year and the royal edition at \$8 a year. The latter contains, besides an interesting variety of appropriate reading matter, a number of most admirable photo-lithographs of high class residences, churches, etc., and other buildings, all executed in the finest manner. The work reflects the highest credit upon the proprietors.

IF any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, containing full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.



# F. W. DEVOE & CO.

(Established 1852)

## PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made only of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS.**

**ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.**  
Catalogues of our different departments to responsible parties.

Cor. Fulton and William Sts., NEW YORK.  
Coffin, Devoe & Co., 176 Randolph St., CHICAGO.



OUR STAINS are made from the best English Colors and pure Linseed oil with a small proportion of petroleum which serves to preserve the wood as well as the color. They do not contain any "gas oil" or "dead oil" which has the smell of Creosote, and we guarantee that all our samples have been dipped in our original stain. WE CLAIM superiority of color which will not wash off and will retain its brightness long after other stains have faded or turned black. Our Stain has been thoroughly tested by many of the leading Architects in this country during the past four or five years, and we have received many flattering testimonials. We will send a package of Stained Boards, by mail, to any address, on application. These small Sample Boards give but an imperfect idea however of the beauty of the Stain as the effect of Stained Shingles can only be seen in a mass on the house. ONE GALLON OF OUR STAIN will dip about 500 Shingles, or cover about 1500 shingles, when brushed on. Please note number on Sample Boards. We would advise Architects to specify as follows:

"DEXTER BROTHERS' ENGLISH SHINGLE STAIN."  
**DEXTER BROTHERS, Sole Manufacturers,  
55 & 57 BROAD ST., BOSTON, MASS.**

Send for copy of Memoranda of Specifications.

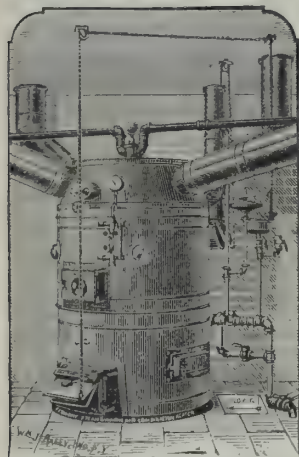
## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

**MURPHY & COMPANY,  
227 BROADWAY,  
New York City.**

## THE ECONOMY COMBINATION



The Combination Heater.

Steam and Warm Air Heater

—AND THE—  
**Economy Warm Air Furnaces**

ARE PERFECTLY ADAPTED TO

**Warming Churches, Schools, Residences, &c.**

THEY ARE GUARANTEED DURABLE AND ECONOMICAL.

Send for our Catalogue, giving full particulars, descriptions, and illustrations of 31 different styles and sizes of Heating Apparatus.

MANUFACTURED SOLELY BY THE

**J. F. PEASE FURNACE CO.**

SYRACUSE, N. Y., AND TORONTO, ONT.

**Eastern Agents.**—EARL B. CHACE & Co., 206 Water St., New York; JOHN DEMAREST, General New England Agent, 75 Union St., Boston; W. H. FENNER & Co., Providence.

**Western Agents.**—ADKINS & HOFFMAN, 177 East Randolph St., Chicago, Ill.; GOSS HEATING AND PLUMBING CO., 703 Main St., Kansas City, Mo.; ARTHUR A. POND, 35 Washington Ave. South, Minneapolis, Minn.; GAGE & HORTON MFG. CO., 1231 Olive St., St. Louis, Mo.

## Architects, \* Builders, \* and \* House \* Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken, leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

**GENERAL OFFICES:**  
No. 708 PENN AVENUE, PITTSBURGH, PA.  
**Branch Offices:**  
Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
139 East Madison Street, Chicago. F. E. Dehenhardt, Manager.

**MANUFACTURERS OF**  
**The WARING ANTI-INDUCTION and BUNCHED CABLES, and**  
**ACHESON COMPOUND CABLE.**

For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial. **Light Leaded Cables (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.**

**Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.**  
All Work Guaranteed. Send for Illustrated Circular.

## GLASS.

**VANHORNE, GRIFFEN & CO.**  
131 to 137 Franklin Street,  
New York,

—Importers of—  
**French Window & Picture Glass**

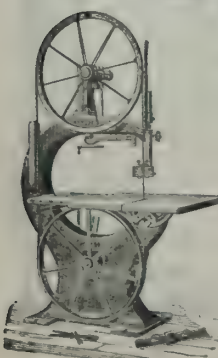
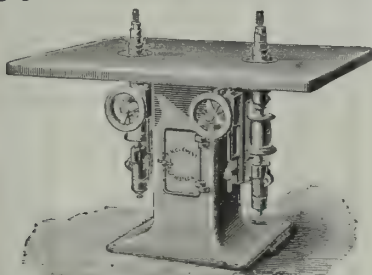
POLISHED AND ROUGH  
**PLATE GLASS**  
Ornamental Glass.

French and German Mirrors.

Manufacturers of  
**Bent and Beveled Glass.**

**BENT GLASS WORKS,**  
NEWARK, N. J.

**Carpenters' and Builders'**  
**WOODWORKING MACHINES.**



Planers, Saws,  
Lathes, Shapers  
Combination  
Machines,  
Shafting, Pulleys  
ETC.

Entire Outfits.

**F. H. CLEMENT,**  
119 Mill St.,  
ROCHESTER, N. Y.

## THE LEIBRANDT & McDOWELL STOVE CO.

PHILADELPHIA  
and BALTIMORE.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

It has all the new features combined in one range; namely, a hinged slip plate, allowing the whole surface of fire to be exposed for broiling; a lift-out bottom oven plate—an entirely new feature; the whole bottom of the oven lifts out, enabling the flues to be cleaned, as well as the bottom oven plate itself; it has a front feed door, making it unnecessary to remove covers to put on coal.

**As a Brick Set Range,**

it requires no brick work except the jambs, all the flues being in the body of the range. Therefore it can be set by any bricklayer.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

We make these ranges either with the Draw-bar shaking grate, Duplex grate, or our Automatic grate, all being interchangeable.

The doors are all fitted with our patent hinge, which insures successful operation both in the oven and fire, the doors always fitting, allowing no escape of heat or gas.

Send for  
**HEATER and RANGE**  
Catalogue.

**JOLLY**

AS A PORTABLE RANGE,

**COOK.**

WITH FEET AND SKIRTING.





**MORSE ELEVATOR WORKS.**



Morse, Williams & Co.  
(Successors to Clem & Morse)  
Builders of all kinds of  
**PASSENGER & FREIGHT**

**Elevators**

Office, 411 Cherry St.  
Works, Frankford Ave., Wilder and  
Shackamaxon Sts.  
**PHILADELPHIA.**

New York Office, 108 Liberty St.



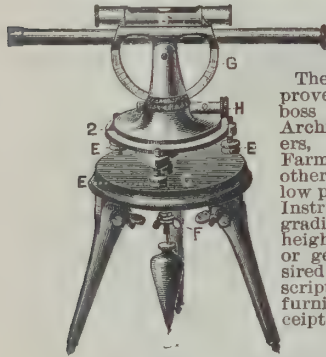
Telephone Call,  
360 Pearl.

**HENRY H. HILL**

36 Pearl Street,  
**NEW YORK,**  
MANUFACTURER OF  
**ELEVATORS**

Factories, Stores, Warehouses,  
Stables, etc., operated by  
Steam, Hydraulic, Belt, and  
Hand Power.  
Shafting, Hangers, Pulleys,  
etc.

**M. B. SWEZEY,**  
MANUFACTURER OF  
**Improved Dumb Waiters**  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
**CHICAGO, ILL.**  
120 Twentieth Street,



**JOHN W. HARMON,**  
65 Haverhill Street, Boston, Mass.

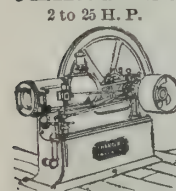
The latest im-  
proved, i. e., the  
boss to Engineers,  
Architects, Build-  
ers, Contractors,  
Farmers, and all  
others requiring a  
low price Leveling  
Instrument for  
grading, measuring  
heights, squaring,  
or getting any de-  
sired angle. De-  
scriptive circulars  
furnished on re-  
ceipt of stamp.



**The Great Church LIGHT.**

FRINK'S Patent Reflectors give  
the Most Powerful, the Softest,  
Cheapest and the Best Light known  
for Churches, Stores, Show Windows,  
Parlors, Banks, Offices, Picture Gall-  
eries, Theatres, Depots, etc. New and ele-  
gant designs. Send size of room. Get  
circular and estimate. A liberal discount  
to churches and the trade.  
**I. P. FRINK, 551 Pearl St., N. Y.**

**CHARTER'S GAS ENGINE.**



The Simplest, most Reliable, and  
Economical Gas Engine  
in existence.

An impulse at every revolution.  
Perfect steadiness guaranteed  
for Arc or Incandescent Electric  
Lights.  
Independent of gas works when  
desired, and makes its own  
gas at a cost of 65 cents per  
M. feet, or about one cent per  
hour to each indicated H. P.

A Perfectly Safe Motor

for All Places and Purposes.  
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.

**Williams & Orton Mfg. Co.**  
**P. O. Box 148. STERLING, ILL.**



Mention this paper.

"ZERO TO 27° BELOW AND THE HEATER GIVES THE BEST OF SATISFACTION."

Letter from E. T. FORD, Esq., Hanover, N. H., in reference to

**GURNEY HOT WATER HEATER.**

HANOVER, N. H., Jan. 5, 1888.

GENTLEMEN:—We have had some good  
weather lately to try the heater. The  
weather has been from zero to 27° below,  
and the heater gives the best of satisfaction  
to all concerned. The coldest day we had  
it gave them all the heat they wanted  
with the water at 180°.

Yours, E. T. FORD.

Illustrated Catalogue and Testimonial Sheet Free.

**Gurney Hot Water Heater Co.**

No. 237 Franklin St., Boston, Mass.

Selling Agencies:

New York, M. H. Johnson, 140 Centre St. | Chicago, Rice & Whitacre Mfg. Co., 42 & 44 W. Monroe St.  
Detroit, T. R. Chase, 31 Edmund Place. | Charleston, S. C., Valk & Murdock, 16, 18 & 20 Hasell St.  
Portland, Or., W. Gardner & Co., 134 3d St. | Covington, Ky., J. L. Frisbie, 526 Philadelphia St.

MENTION THIS PAPER.

Although sheet steel is still more expensive than iron, we have decided  
to use it exclusively for our Standing Seam, and also for our Roll and  
Cap Roofings, as we find that the practical advantages to customers  
in steel are so marked that we are confident its use will so increase our  
patronage that we will be generously recompensed for using the more  
expensive material.

Sheet steel is pliable, tough—hence, will not crack; there is no cinder  
or clay in sheet steel—both a fruitful cause of defects in iron.

**THE CINCINNATI CORRUGATING CO.,**

150 Eggleston Avenue,

Cincinnati, Ohio.

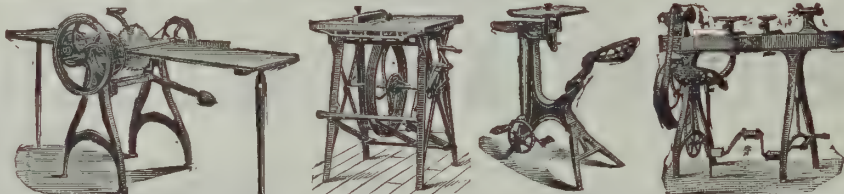


**HENRY S. NORTHROP.**

Corner Centre & Franklin St. New York, N.Y.

**PANELED SHEET IRON CEILING**

FIRE PROOF, ORNAMENTAL, DURABLE, QUICKLY PUT UP.  
SUITABLE FOR ALL CLASSES OF BUILDINGS.  
CAP SEAM AND CRIMPED IRON ROOFINGS.



**FOOT-POWER MACHINERY.**

COMPLETE OUTFITS FOR CONTRACTORS AND BUILDERS.

Machines for ripping, cross-cutting, scroll-sawing, mortising and  
tenoning, forming edges, grooving, gaining, rabbeting, cutting  
dados, and turning. Builders use our Hand Circular Rip Saw for  
the greater portion of their ripping in preference to carting their  
lumber to a mill five minute's drive from their shops. The same  
is true in regard to scroll sawing, mortising, tenoning, cutting stuff  
for drawers boxes, etc. Builders using these machines can bid  
lower and save more money from their contracts than by any  
other means.

**Read the Following Letters from Builders:**

CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your  
Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the  
ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped  
as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs  
and sawed all drips for 200 windows."

ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers  
to make for a drug store; the steam power mill wanted 50 cents each for making them.  
With my foot power machinery I made them, and saved \$25 above good wages on the job.  
If desired, these machines will be sold ON TRIAL.

The purchaser can have ample time to test them in his own shop and on the work  
he wishes them to do. Descriptive Catalogue and Price List Free.  
**W. F. & JOHN BARNES CO., No. 567 Ruby St., Rockford, Ill.**

**CHAS. E. LITTLE, 59 FULTON ST. New York.**

Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for

**W. F. & J. Barnes' Workshop MACHINERY.**

New York Agency.

Factory Prices.



**Patent Foot Power Machinery.**

The Latest and Most Improved, for  
**Carpenters, Builders, Cabinet Makers and  
Wood and Metal Workers Generally.**

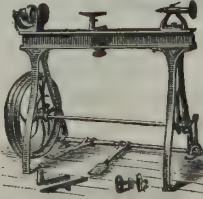
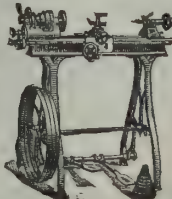
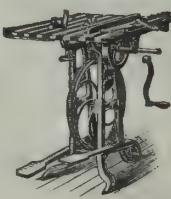
Machines for Scroll Sawing, Ripping, Cross-Cutting, Mit-  
ring, Rabbeting, Grooving, Gaining, Beading, Variety  
Moulding, Boring, Mortising, Tenoning, Wood and  
Metal Turning, Screw Cutting, Etc., Etc.

Enterprising Mechanics are quick to see the Superior Merit of our Machines.

Machines sold ON TRIAL if desired. Send for Catalogue and  
Price List, giving full description, testimonials, etc.

**THE SENECA FALLS MFG. CO.,**

276 WATER ST., SENECA FALLS, N. Y.



MANUFACTURED BY

**CUSHMAN BROS. & CO.,**

BOSTON, MASS.

All Shades and Upholstery Goods at  
Bottom Prices.

**MANAHAN'S**

**PARCHMENT SHEATHING**

Strongest, Lightest, most Waterproof.

One Dollar's worth covers more ground than same  
amount of most sheathing. Send for Samples.

**HALLETT BROS., Sole Agents,**

290 Devonshire St., BOSTON.

**E. & H. T. ANTHONY & CO.,**

591 Broadway, N. Y.

Manufacturers and Importers of

**PHOTOGRAPHIC**

**INSTRUMENTS,**  
Apparatus and Supplies,

OF EVERY DESCRIPTION.

Sole Proprietors of the Patent  
Detective, Fairy, Novel, and  
Bicycle Cameras, and the Cele-  
brated Stanley Dry Plates.  
Amateur Outfits in great varie-  
ty from \$9.00 upward. Send for  
Catalogue or call and examine.

More than Forty Years Estab-  
lished in this line of business.

ESTABLISHED 1854.

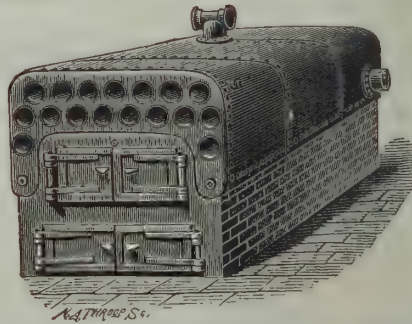
**DEVINE'S STEAM BOILER WORKS,**

Marine, Locomotive, Tubular, House, and

**GREENHOUSE BOILERS.**

WROUGHT IRON HOT WATER BOILERS  
A SPECIALTY.

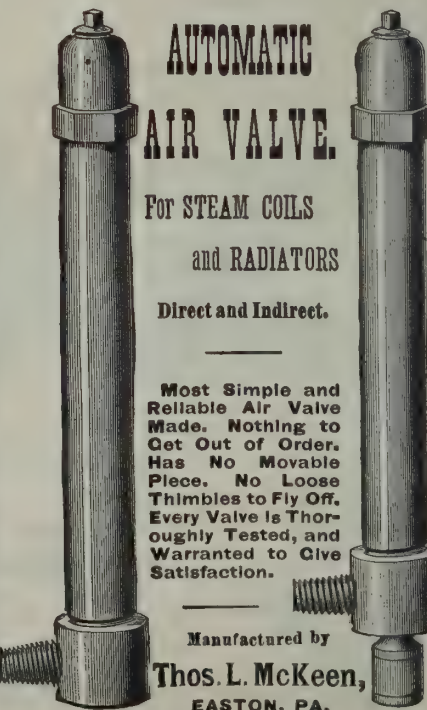
Manufactory, 381 to 393 S. Canal Street, Chicago.



The above cut is of Greenhouse Boiler, meeting  
with universal success wherever placed. Estimates  
gladly furnished for any capacity.

**PETER DEVINE,**

387 S. CANAL ST., CHICAGO.



**AUTOMATIC**

**AIR VALVE.**

For STEAM COILS

and RADIATORS

Direct and Indirect.

Most Simple and  
Reliable Air Valve  
Made. Nothing to  
Get Out of Order.  
Has No Movable  
Piece. No Loose  
Thimbles to Fly Off.  
Every Valve is Thoro-  
ughly Tested, and  
Warranted to Give  
Satisfaction.

Manufactured by

**Thos. L. McKeen,**  
EASTON, PA.



**OIL WELL SUPPLY CO., Limited.**

PITTSBURGH, PA.,  
OIL CITY, PA., and  
BRADFORD, PA.  
MANUFACTURE AND SELL ALL KINDS OF

**Tools and Machinery**

BOILERS, ENGINES, TUBING, CASING and ROPE  
FOR

**Drilling, Equipping, and Pumping Artesian Wells,**

And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,  
NATURAL GAS,  
WATER, or STEAM.

**Fine Office & Bank Fittings**

BRASS & WIRE WORK.  
A.H. ANDREWS & CO. 195 Wabash  
Ave., Chicago, and 686 Broadway, N. Y.

**THE "IDEAL" PATENT TILE-LINED BATH-TUB.**

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,  
BAKER BUILDING,  
1524 CHESTNUT ST., PHILADELPHIA.

Send for Illustrated Circular and References.

**MAXWELL'S Gypsum Paint**

For Whitening and Coloring Churches, Factories, Mills, Dwellings, Barns, Fences, or for any purpose where whitewash or kalsomine is used. Made in a variety of standard colors. Put up in 1/2 and one gallon, also 1/4, 1/8, and one barrel quantities. A Beautiful, Durable, and Cheap article. Will stand any climate.

MANUFACTURED BY  
**JOHN MAXWELL,**  
1603 OTSEGO STREET,  
PHILADELPHIA.

**Tirrill's Equalizing Gas Machines.**

The only machine in the world that can make this white, smokeless flame with an ordinary Gas Burner.  
SEND FOR CIRCULARS.

**TIRRILL'S EQUALIZING GAS MACHINE**  
Produces this exact flame with any open burner of suitable size. The only machine in the world that can do it. No Argands or adjustables required.  
Makes Standard, Uniform, White, and Absolutely Smokeless Gas.  
For circulars and information address  
**TIRRILL GAS MACHINE CO., 39 Dey Street, New York.**

**MALLORY'S STANDARD SHUTTER WORKER**

Opens and closes the blinds without raising the window.

Automatically locks the blinds in any position.

Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

Can be applied to old or new houses, of brick, stone, or wood.

AGENTS WANTED.

Send for Illustrated Catalogue to

**Frank B. Mallory,** FLEMINGTON, NEW JERSEY, or  
60 LIBERTY STREET, NEW YORK.

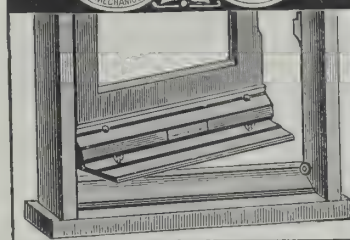
**RICHMOND WEATHER STRIP CO.**

MANUFACTURERS OF

ROWLETT'S INDEPENDENT

AUTOMATIC COUNTER-BALANCED

**WEATHER STRIP.**



AWARDED BRONZE MEDAL AT CINCINNATI INDUSTRIAL EXPOSITION 1884

HAS NO SPRINGS, TRIGGERS OR CIRCLE IRONS; POSITIVE ACTION; CANNOT GET OUT OF ORDER; FITS ANY DOOR.

AGENTS WANTED IN EVERY CITY AND TOWN IN THE U.S. SEND FOR CIRCULAR. SAMPLE STRIP, PREPAID TO ANY PERSON ON RECEIPT OF \$1.00. ADDRESS

**RICHMOND WEATHER STRIP CO. RICHMOND, IND.**

P.O. Box 282. FACTORY 217 N. 6TH STREET. MENTION THIS PAPER.

ESTABLISHED 1844.

**SAMUEL H. FRENCH & CO.,**

York Avenue, Fourth and Callowhill Sts.,  
PHILADELPHIA, PA.

**PAINT MANUFACTURERS.**

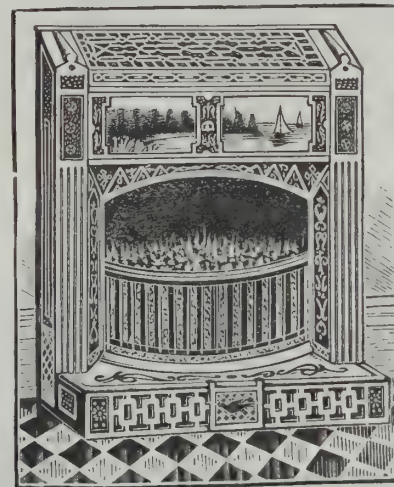
Strictly Pure Lead, Zinc and Colors; Dry, in Oil, Japan, and Ready Mixed for Use.

**PEERLESS MORTAR COLORS.**

BLACK, BROWN, BUFF, AND RED.

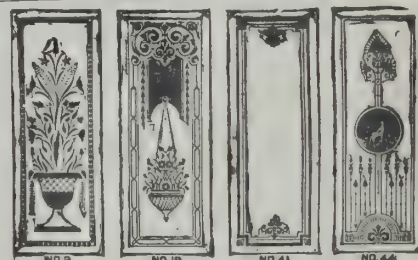
Masons' and Builders' Supplies.

SEND FOR CATALOGUE AND CIRCULARS.

**THE ALDINE FIREPLACE.**

The Aldine is economical as well as sanitary in its results. It is the only Grate that can be piped to common chimneys, one or more rooms removed from the Grate itself, with as good results as if set in a chimney place. The Aldine secures perfect and slow combustion of fuel, warm floors, constant circulation of warm air, and perfect ventilation. The Aldine has the return draught principle of a hard coal stove embodied in it, and compares with all other grates only as the modern return draught base-burning stove of to-day compares with the direct draught coal stove of 25 years ago. Send for illustrated circular. Address

ALDINE MFG. CO., GRAND RAPIDS, MICH.



EDWIN LEE BROWN, Pres't.

**The Western Sand Blast Co.,**

Ornamenters of Glass for

VESTIBULE DOORS,

TRANSOMS,

BANK & OFFICE COUNTERS,

and

Manufacturers of Advertising

Glass Signs.

Sand Blast & Embossed Rail-

road Glass a specialty.

N.W. Cor. Clinton & Jackson Sts.,

CHICAGO, ILL.

Telephone 4065.

**THORN SHINGLE & ORNAMENT CO.,**

SOLE MANUFACTURERS OF

The Best and Cheapest Metallic Roofing

**TILES AND SHINGLES**

YET OFFERED TO THE BUILDING TRADE.

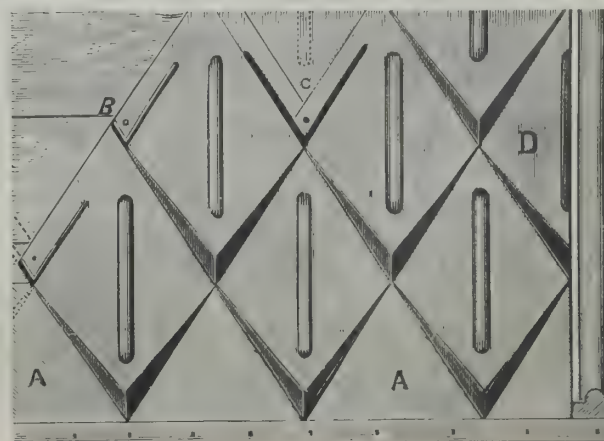
The Horseshoe Spring-Lock Shingle (Patten's Patent) just out. This Shingle can be put on in one-half the time it requires with any other shingle now in the market. Is cheap, durable, secure, thoroughly water-tight and makes a good appearance as a roof covering. Two (2) sizes.

**THORN'S PATENT ROOFING and WALL TILES,** the most perfect and Unique Roof, Gable, Tower, and Wall covering, yet produced in metal. On the roof in appearance they are like terra cotta earthen tiles, and are better, and half the cost. Four (4) designs or sizes are made.

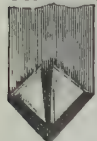
All the above goods are packed a square to the box and delivered f. o. b. cars in Philadelphia.

For particulars, price lists, etc., address

**THORN SHINGLE & ORNAMENT CO.** 12th & Callowhill Streets, Philadelphia, Pa.





**THE PRENTICE METALLIC HIP SHINGLE**

Patented Sept. 21, 1886.  
Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application.

**RETAIL PRICES.**

Plain, for Shingle Roofs, - \$3.00 per Hundred.  
Painted, for Shingle Roofs, - 3.50  
Galvanized Iron, for Slate Roofs, - 7.00  
Copper, for Slate Roofs, - 22.00  
Liberal Discounts to Dealers and Contractors.

Orders promptly filled. Address, Box 184.  
METALLIC HIP SHINGLE CO., 516 to 520 Summit St., Toledo, O.

**The Draper Recording Thermometer.**

This thermometer gives a permanent and continuous record in ink of the temperature. The chart indicating hours of the day and days of the week gives the degrees of temperature from 20° below zero to 110° above. All instruments are accurately adjusted and warranted. The record is easily read and absolutely correct. Sold by the leading instrument dealers and opticians throughout the United States and Canada, and by

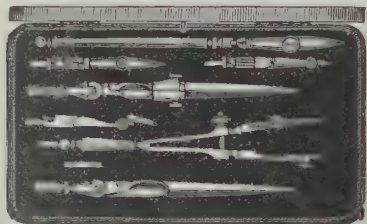
**The DRAPER MANUFACTURING CO.**

Owners of the United States and foreign patents, 152 Front Street, New York

**L. MANASSE,**

IMPORTER AND MANUFACTURER,

88 Madison Street, Chicago, Ill.

**ARCHITECTS' AND SURVEYORS' SUPPLIES.**

Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.

Improved LEVELS for Builders and Tiling.

Illustrated Catalogues Sent on Application.

JOHN WHEELER,  
CARPENTER and BUILDER

**ORNAMENTAL RUSTIC WORK.**

Medals from American Institute, And other Associations.

P. O. Box 140. Cleveland St., Orange, N. J.



Anderson & Dickey,  
ARCHITECTURAL  
WOOD TURNING

—AND—  
Spiral Moulding,  
43 BRISTOL ST.  
BOSTON, MASS.

Stair Builders' Supplies  
BALUSTERS.

Newels solid or built up.  
Stair Rails of all dimensions  
worked ready to put up.  
Rope Moulding of all sizes,  
Mantels, Office Fittings, etc.  
Correspondence solicited.  
Send two-cent (2c.) stamp  
for illustrated catalogue.

**THE****Standard Wood Turning Co.**

58 BAY STREET,  
Jersey City, N. J.

**MACHINE-TURNED  
BALUSTERS**

Various Sizes and Patterns Dove-  
tailed ready for use, with Tait's  
Patent Dovetail.

PEDESTAL and TURNED NEWELS.

STAIR RAILS,

Of all dimensions, worked, ready  
to put up.

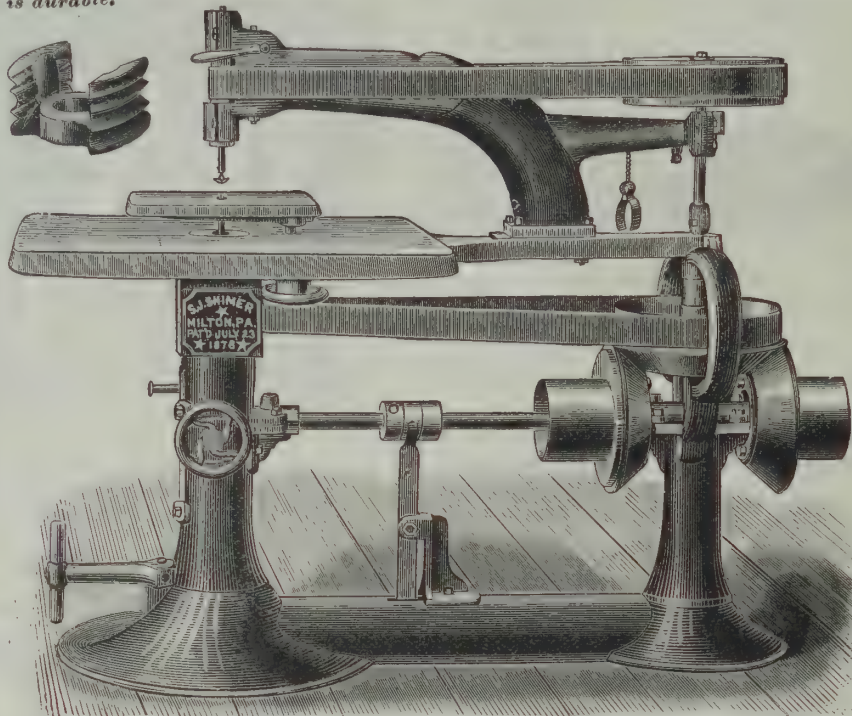
Send 4c. Stamp for our 32-page  
Catalogue, containing 200 Illustrations  
of Balusters, Pedestal Newels,  
Brackets, Drops, etc.

**Shimer's Variety Moulder, with  
Surface Moulding Attachment.**

**FOR SINKING** panels with pattern guided by pin that automatically takes its position when you start the Machine, and drops out of the way when you stop it. The Cutter in the overhanging arm of the Machine has a perpendicular adjustment of one inch, and is operated by the handle shown in the cut attached to an eccentric lever that is automatically locked to the one position when at work.

**TO CHANGE** from Surface Moulder to Variety Moulder, disconnect the rod that runs the incline on the T lever and pin it up. Run the housing up by means of the hand wheel until it stands above the belt line, remove the one spindle, substitute the other and set screw it to the housing. Turn the small table back under the arm. Raise the arm, disconnect the shaft that runs the upper pulley, and the Machine becomes an Edge Moulder without having any of its parts unbolted and laid away.

*You never tire of the make up of this Machine, which is as simple and effective as it is durable.*



Reversible Cutters for any shape of mould made to order, and warranted to cut free and easy. For Circulars and full information, address,

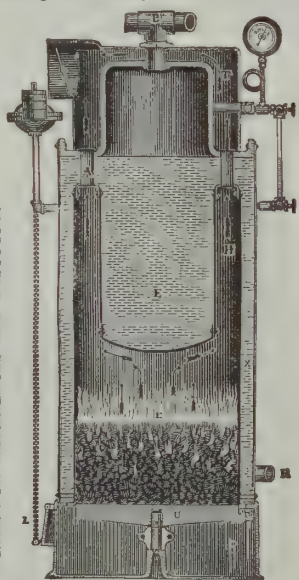
**SAMUEL J. SHIMER & SONS,**

MANUFACTURER of the SHIMER CUTTER HEADS and SPECIAL WOODWORKING MACHINERY.  
MILTON, PENN.

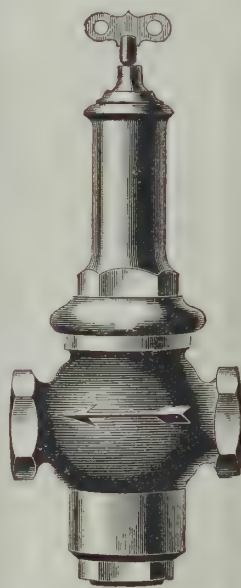
**Duplex Steam-Heater Co.**

Manufacturers under FISKE'S PATENTS,  
10 Barclay Street, New York.

Simplest in Construction.  
Largest Steaming Capacity.



Write for REFERENCES and DISCOUNT.  
AGENTS WANTED EVERYWHERE.  
Send for Illustrated Catalogue and Price-List.

**OUR  
REDUCING  
VALVE**

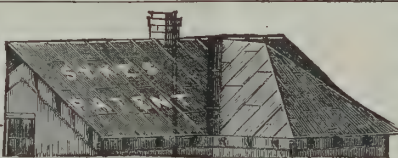
Is the standard used  
by the American and  
Southern Cotton Oil  
Companies and all the  
Sugar Refineries.

**MASON  
REGULATOR  
CO.,  
BOSTON.**

Steam Regulating  
Devices.

**SYKES' IMPROVED**

Best Roof in  
the World.  
Suitable for all  
classes of Build-  
ings. Easy put  
on.



All my Iron is  
Re-Rolled and  
Box Annealed,  
well Painted  
on both sides  
with Best of  
Paint and  
Pure Linseed  
Oil.

**SYKES IRON ROOFING CO., NILES, O.**

Send for Circular and Price List, and mention this Paper.

**WOOD FLOORS**

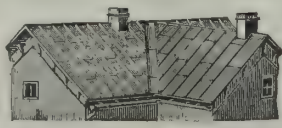
BOUGHTON AND TERWILLIGER  
232 STREET UNDER FIFTH AVE. HOTEL

**CANTON IRON ROOFING CO., Canton, Ohio.**

MANUFACTURERS OF THE H. W. SMITH PATENT

**STEEL  
ROOFING.**

Made of genu-  
ine sheet steel  
and calaminated  
steel.

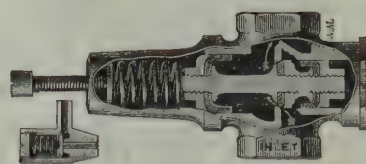
**CORRUGATED IRON**

Roofing and Siding,  
Beaded Iron Ceiling  
and Siding, Crimped  
Edge Roofing and  
Siding, Roof Paint,  
Roofers' Paper, etc.

Send for catalogue, price list, and samples.

**ARCHITECTS**

SHOULD ALWAYS SPECIFY

**Mueller's WATER PRESSURE Regulators**

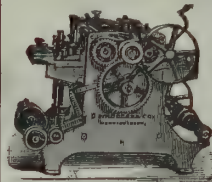
to insure against the bursting of pipes and to pre-  
serve a uniform pressure throughout the build-  
ing. Write for illustrated catalogue and prices.

H. MUELLER MFG. CO.,

220 and 222 East Main St., Decatur, Ill.

**No. 11 PLANER & MATCHER**

Double Belted and Geared  
Lower Rolls.



Special Machinery for Car  
Work and the latest im-  
proved Woodworking Ma-  
chinery of all kinds.

C. B. ROGERS & CO.  
Norwich, Conn.

109 Liberty Street,  
New York.

**TO ARCHITECTS.**

THE undersigned has had much experience in the  
making of perspectives from plans and eleva-  
tions, and will promptly execute any orders, either  
in ink or colors as desired.

A. F. LEIGHT,

361 Broadway, New York.

TERMS MODERATE.

**Instantaneous Water Heater Co.**

Manufacturers of the

**DOUGLASS PATENT**

Instantaneous Water Heater,

FOR

Baths and Domestic Purposes.

Can be used any place where  
gas and water can be obtained.



210  
Illinois St.,  
Chicago.

ESTABLISHED 1843.

Manufacturers of

**Stable Fittings and Fixtures,**

IMPROVED and PATENTED.

IRON, BRASS, BRONZED and NICKEL-PLATED

POULTRY YARD APPLIANCES, ETC.

Low estimates furnished to Architects, Builders,  
Carpenters, Masons, etc.

Catalogue Mailed on Application.

SAMUEL L. BENT & SON,

No. 111 Chambers St., New York City.

**LEFFEL'S HOUSE PLANS.**

CONTAINING

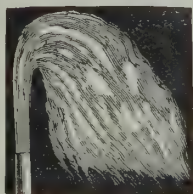
Elevations, Plans and

Descriptions of Houses

costing from \$500 to \$3,000, and adapted to families  
having good taste and moderate means. Including  
the six prize plans in the *Mechanical News* compe-  
tition. One oblong quarto, \$2.00.

Sent by mail, postage prepaid, on receipt of the  
price. Address

MUNN & CO., Publishers of Scientific American,  
361 Broadway, New York.

**ARTESIAN**

Wells, Oil and Gas Wells, drilled  
by contract to any depth, from 50  
to 300 feet. We also manufacture  
and furnish everything required  
to drill and complete same. Port-  
able Horse Power and Mounted  
Steam Drilling Machines for 100 to  
600 ft. Send 6 cents for illustrated  
catalogue.  
Pierce Well Excavator Co.  
New York.



ESTABLISHED 1868  
THE HAYES  
SKYLIGHTS  
PERFORATED  
METALLIC  
BLINDS  
71-8TH AVE. NEW YORK.



THE LATEST & BEST IMPROVED  
**BRICK MACHINES**  
FOR BOTH STEAM  
AND HORSE POWER.

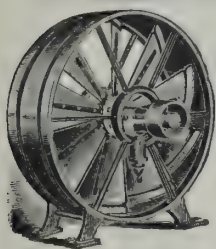


STEAM POWER BRICK MACHINE WITHOUT GEARING.  
STEAM POWER BRICK MACHINE READY FOR PULLEY.



SEND FOR ILLUSTRATED CATALOGUE  
**HENRY MARTIN,**  
INVENTOR, PROPRIETOR,  
AND MANUFACTURER.  
139 CHESTNUT ST.  
LANCASTER, PA., U.S.A.

HORSE POWER BRICK MACHINE.



**Clark's New Drying Exhaust and Ventilating Fans.**  
**PATENT ADJUSTABLE WINGS.**  
Capacity Quickly Increased or Diminished.  
Self-Oiling Bearings. Light Running.  
Durable.  
PRICE LIST FREE.  
GEO. P. CLARK, (Box A), Windsor Locks, Ct.  
JAMES GOLDSMITH, New York Agent, 744 BROADWAY.

ESTABLISHED 26 YEARS  
**PECORA MORTAR STAINS**  
30% SAVED IN COST



WILL NOT FADE OR RUN  
TRADE MARK  
— Send for Circular E. —

MANUFACTURED ONLY BY  
**S. BOWEN'S SONS,**  
150 N. 4th St., Philadelphia, Pa., U. S. A.

**PASSENGER ELEVATORS,**  
MANUFACTURED BY  
**HOWARD IRON WORKS,**  
BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

**GRAVES' ELEVATORS,**  
PASSENGER and FREIGHT,  
MANUFACTURED BY  
**L. S. GRAVES & SON,** Rochester, N. Y.  
BRANCH OFFICE: 46 Cortlandt Street, New York.

THE  
**WELLS PROCESS**  
Rustless Oxide of Iron.  
The Newest and Best Process  
FOR  
**PROTECTING IRON.**  
Special and Exclusive Rights for Sale

**RUSTLESS IRON WATER PIPE**  
SEND FOR CATALOGUE  
**THE WELLS RUSTLESS IRON CO.**  
21 CLIFF STREET NEW YORK

**H. W. JOHNS' Asbestos Patented Roofing**  
**FIRE-PROOF.**  
This is the perfected form of Portable Roofing manufactured by us for the past thirty years: is adapted for use on steep or flat roofs in all climates, can be easily applied by unskilled workmen, and costs only about half as much as tin. Samples and descriptive price list free by mail.  
**H. W. JOHNS MFG. CO.,** 87 Maiden Lane, N. Y.  
Chicago. Philadelphia. London.  
Sole Manufacturers of H. W. Johns' Liquid Paints, Asbestos Fire-Proof Paints, Sheathings, Building Felts, Asbestos Steam Packings, Boiler Coverings, etc. **VULCABESTON** Moulded Piston-rod Packing Rings, Gaskets, etc.


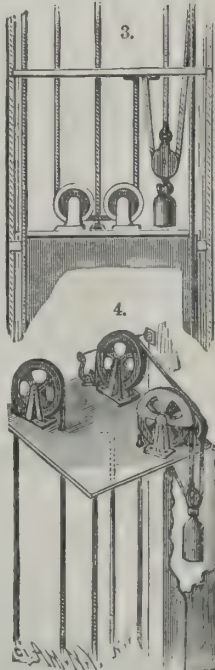



**Mineral Wool**  
FOR  
FIRE-PROOFING,  
DEADENING SOUND,  
and INSULATION of HEAT  
and COLD in  
RESIDENCES,  
COLD STORAGE, and  
REFRIGERATING ROOMS.  
Descriptive Pamphlet and  
Sample Free.  
**ADDRESS:**  
**Western Mineral Wool Co.,**  
Cleveland, O.  
St. Louis, Mo.

**ICE & REFRIGERATING** Machines. York Patent. **YORK MFG. CO.,** York, Pa.  
Attention is called to Fireproof and Vermin Proof  
**MINERAL WOOL**  
As a Lining in Walls and Floors for preventing the  
Escape of Warmth and the Deadenng of Sound.  
Sample and Circular Free.  
**U. S. Mineral Wool Co.,** 2 Cortlandt Street, N. Y.

To Architects,  
Builders,  
and Owners.

**NEW YORK SAFETY DUMB WAITER FIXTURES**  
Patented United States, April 19th, 1887; in Canada, May 18th, 1887.  
The MOST COMPLETE, SIMPLE and ABSOLUTELY SAFE WAITER made. Provided with SAFETY ROPE, AVOIDING ACCIDENT. ENTIRELY NOISELESS, and moves with perfect ease. FIXTURES ONE SIZE ONLY, adapted to any size waiter. Can be adjusted by any CARPENTER or MECHANIC. DIAGRAM and FULL DIRECTIONS ACCOMPANY EACH SET.  
HANDSOMELY BRONZED, and packed ONE SET in a BOX. Sold by the Hardware trade.  
PRICE, 15.00.  
For catalogue address the manufacturers.

**THE EDWARD STORM SPRING CO., Limited,**  
Poughkeepsie, N. Y.  
or, **JOHN H. GRAHAM & CO.,** Sole Mfrs. Agents,  
113 Chambers Street, New York.



## The Great Architect. H. H. RICHARDSON AND HIS WORKS.

By Mrs. SCHUYLER VAN RENSSELAER.  
With a fine portrait of Mr. Richardson, twenty-six full-page Heliotypes, and over seventy other sketches, full-page and smaller, illustrating Mr. Richardson's works. *The edition is limited to 500 copies.* In a quarto volume, attractively bound. \$20.00.

Mrs. Schuyler Van Rensselaer's great monograph, *Henry Hobson Richardson and His Works*, is one of the most beautiful art books ever attempted in this country, and has the special merit of being American in spirit and substance, in matter and manner, in its genius and in workmanship. In form it is a folio, the page being twelve inches wide by fifteen in height. There are ix and 152 pages of text, thirty-seven full-page illustrations, and nearly double that number in the text. Almost all the full-page illustrations are beautiful heliotypes, making a really splendid gallery of Mr. Richardson's principal works. Whether it would have been possible to find a better biographer for Mr. Richardson than Mrs. Van Rensselaer it is not easy to determine. It is manifest, however, that her work is adequate and satisfying—an extraordinary achievement, which will add to Mrs. Van Rensselaer's fame and give great pleasure to Mr. Richardson's admirers in the profession.—*Boston Beacon*.

## Building and Buildings.

**BUILDING CONTRACTS, LEASES, EASEMENTS, AND LIENS.** By A. PARLETT LLOYD, Esq., of the Baltimore bar, author of "The Law of Divorce." 1 vol. 8vo, cloth, \$4.50; law sheep, \$5.00.

This is the first adequate American treatise ever published on the Law of Building. Mr. Lloyd has made a careful and exhaustive study of the subject, and his work contains reference to and citations from every important English and American case upon matters relating to building. It is a plain, clear statement of the law as enacted by legislation and decided by the courts, and is a work of great value to builders.

\*.\* For sale by all Booksellers. Sent by mail, postpaid, on receipt of price by the Publishers.

**HOUGHTON, MIFFLIN & CO., Boston,**  
11 East Seventeenth Street, New York.

**SEBASTIAN, MAY & CO.,**  
Manufacturers of and Dealers in  
**Hand and Foot Power Machinery**  
For CARPENTERS, BUILDERS, MACHINISTS, etc.  
Write for our New Catalogue, just issued.  
**183 W. Second St., Cincinnati, O.**

**GIBBS' ENGLISH PORTLAND CEMENT**  
unrivalled for quality and Cheapest to use.

**INGHAM'S ENAMELED BRICKS**  
Are beautiful for Decoration and Interior Finish. Send for Catalogue, etc., of Novelties.

**HOWARD FLEMING, 23 Liberty St., New York.**

**E. J. JOHNSON,**  
**SLATE BLACKBOARDS,**  
**— ROOFING SLATE.**

SLATE ROOFERS' SUPPLIES.  
HEARTHES, SILLS, LINTELS, STEPS, MANTELS.

Special orders will receive prompt attention. Send for estimates.  
Quarry: Bangor, Pa. Office: 18 Burling Slip, New York.

Send for descriptive circular of Indestructive Slate Roof for Flat Roofs only.

## American Foundry Practice.

Treating of Loam, Dry Sand, and Green Sand Moulding, and containing a Practical Treatise upon the Management of Cupolas and the Melting of Iron. By Thomas D. West, Practical Iron Moulder and Foundry Foreman. Sixth Edition, with Index, fully illustrated, 12mo, cloth. \$2.50.

"One hundred items that apprentices should know and remember, alone are worth the price of the whole work. \* \* It is not written with a special view to instructing apprentices, but as a handbook for men who have learned the trade."—*American Machinist*.

"Mr. West thoroughly understands the details of his trade and the snares and pitfalls which beset inexperienced journeymen, who will find in this work the solution of many vexatious and incomprehensible things."—*Mechanical Engineer*.

## Moulder's Text-Book:

BEING PART II. OF

### American Foundry Practice.

Presenting Best Methods and Original Rules for Obtaining Good, Sound, Clean Castings, and Giving Detailed Description for Making Moulds Requiring Skill and Experience: also containing a Practical Treatise upon the Construction of Cranes and Cupolas, and the Melting of Iron and Scrap-Steel in Iron Foundries. By Thomas D. West. Fully Illustrated and with Complete Index. Third Edition, 12mo, cloth. \$2.50.

"It contains 460 pages, and the matter is equally as good as that of the first volume (American Foundry Practice)—in fact, we think it better, if possible. Under the head 'American Cupola Practice' forty-six reports of the working of cupolas are given, the cupolas being in thirty-six States. In these, complete dimensions of the cupolas, size, speed of blowers, time of starting fires, charging iron and coal, time of melting, iron melted and fuel used, and other particulars are noted."

"FOUNDRY CRANES.—But little has been published on this subject, and what the author gives from experience will doubtless be appreciated. Altogether the book is one that every moulder and every one interested in such matters should possess."—*American Machinist*.

Mailed and prepaid on receipt of price. Catalogues gratis.

**JOHN WILEY & SONS,**  
15 Astor Place, New York City.

N. B.—Any one willing to engage as a canvasser for these volumes can ascertain our terms on application.

## Superior Copper Weather Vanes

GILDED WITH PURE GOLD.

TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.  
Vanes made from any Drawing or Design on Short Notice.



**T. W. JONES,**  
SUCCESSOR TO  
**CHAS. C. BRIGGS,**  
**V. W. BALDWIN,**  
Removed from 213 Pearl Street to  
**170 & 172 Front St.,**  
Near Maiden Lane,  
**NEW YORK.**

Illustrated catalogue of over 250 designs, mailed to any address on receipt of a two cent stamp, half the postage.

## Notes and Queries.

(1) W. H. R.—The walls of ice houses should be started from the bottom with hay packing at least 6 inches thick, with tight board lining inside and double row of hay packing above ground. Pack the ice with 6 inches of hay next to the walls all around. Hay is better than straw to confine the air in the packing. Place 2 to 3 feet of hay on top of the ice. Take out the ice from the top, always covering as soon as possible.

(2) H. W. S., Jr., writes; I have a cistern from which a lead pipe connects with a pump in the kitchen. The water is of a yellowish cast and very foul. The water drawn from the neck of the cistern with a bucket is of good taste and void of odor. Can you give me a remedy? A. The surface water of your cistern is purified by absorption of air. There is no circulation by which the water at the bottom is brought to the surface. The oxygen or air that is carried into the cistern, combined with the water, is soon absorbed in oxidizing the vegetable and other matter in the water. When no more oxygen is available a putrid decomposition sets in, which is the trouble that you complain of. The only remedy is thorough and often cleaning of the cistern, or forcing air down to the bottom, allowing it to bubble up through the water. A small force pump will answer the purpose. A bag of charcoal pushed down to the bottom, and held there, may improve the water.

(3) A. E. S. asks: Which possesses the greater strength when placed horizontal, standing on highest edge—a piece of timber 40 feet long, 12x18 inches, or piece same length, but 14x16 inches? A. The 12x18 inches is the strongest, its moment of inertia being 5,832, while the moment of inertia of the 14x16 beam is only 4,778, and their safe load at center 6,026 pounds and 5,555 pounds.

(4) C. S. A. writes: What kind of a wash can I use to remove tobacco stains from new pine floors? I have just finished a new house, and the mechanics have left tobacco stains upon the floors, which sal soda and hot water does not entirely remove. A. Take one part calcined soda and allow it to stand ¾ hour in 1 part slaked lime, then add 15 parts water and boil. Spread the solution thus obtained upon the floor with a rag, and after drying rub with hard brush and fine sand and water. A solution of 1 part concentrated sulphuric acid and 8 parts water will enliven the wood after above application. When dry, wash and wax the floor.

(5) G. B. W.—For concrete that does not shrink, use equal parts by measure of Portland or Rosendale cement and clear, sharp sand. Mix quickly to a thin paste with water, and then quickly mix therewith an equal bulk of fine broken stone, put in place and use a large faced hand ram to work the concrete even, with light strokes of the ram. A heavy shovel will answer the purpose for thin concrete. Galvanized iron will not corrode when set in concrete or asphalt composition. Mortar does not corrode galvanized iron. Mortar of lime and sand is cheaper than cement.

## THE TIFFANY GLASS COMPANY

MEMORIAL WINDOWS  
GLASS WORK DECORATIONS

Designs and Estimates submitted.

333-335 Fourth Ave., New York City.

## J. B. Lippincott Co.'s New Publications

### THE CHEMICAL ANALYSIS OF IRON

A Complete Account of All the Best-Known Methods for the Analysis of Iron, Steel, Pig-Iron, Iron Ore, Limestone, Slag, Clay, Sand, Coal, Coke, Furnace and Producer Gases. By ANDREW ALEXANDER BLAIR, Chief Chemist United States Board appointed to Test Iron, Steel, and other Metals, 1875; Chief Chemist United States Geological Survey and Tenth Census, 1880. Octavo. Handsomely Illustrated. Extra cloth. \$4.00.

Considering the enormous extent of new iron and steel industries, and their dependence upon chemistry, this work should be a welcome addition to the literature of the subject. It is intended as a text-book for students of iron-chemistry, and as a book of reference for analytical chemists interested in this branch of the profession. It contains a description of many forms of useful apparatus and the means for preparing and testing all the reagents required in the analysis of iron, and also includes a chapter on the technical analysis of furnace and producer gases. The author's official relations have given him unusual advantages in this class of work, and the methods described embrace not only the elaborate and exact ones necessary for scientific purposes, but all the rapid processes in use at steel works.

"It is a hand-book which will be found invaluable by the metallist, and may be considered the best book of the sort in the market."—*Boston Courier*.

"A technical work that has cost a good deal of study, and it ought to find ready sale among ironmasters and analytical chemists."—*The Wisconsin Milwaukee*.

### THE ANIMAL LIFE OF OUR SEA-SHORE.

With Special Reference to the New Jersey Coast and the Southern Shore of Long Island. By ANGELO HEILPRIN, Professor of Invertebrate Paleontology at the Academy of Natural Sciences of Philadelphia; author of "The Geological Evidence of Evolution," "Town Geology," "The Lesson of the Philadelphia Rocks," etc. Fully illustrated. 12mo. Cloth. \$1.25. Paper. 50 cents.

A volume of this nature has long been a desideratum with visitors and residents at the seaside, and an acquaintance with its contents will add very much to the pleasure of every ramble along the beach. The various forms of animal life which are constantly attracting attention—their nature, uses, habits, resorts, etc.—are accurately described in an easy, attractive and popular style, free from technicalities. The volume is very readable, and will prove an agreeable change for those surfeited with the ordinary summer light reading, and a fruitful source of information and amusement to all who are interested in the study of nature. The numerous illustrations, which render the identification of specimens very easy, add materially to the value of the work.

"A work that will certainly prove extremely interesting to all during their summer vacations. It may be relied upon as being thoroughly accurate, and tells just what you want to know."—*New York Science*.

"A valuable and pleasant little hand-book. It is cheap, untechnical, well illustrated, soundly scientific, and is just the thing for any seashore wayfarer or resident who has the intelligence and taste to care to look into the wonders of the deep."—*New York Graphic*.

If not obtainable at your Booksellers', send direct to the Publishers, who will forward the books, post-paid, on receipt of the price.

**J. B. LIPPINCOTT CO., Publishers,**  
715 & 717 Market St., Philadelphia.

## THE American Architect & Building News

An illustrated weekly journal.

Yearly subscription to regular edition,	\$6.00
" " " " " " " " " " " "	7.00
" " " " " " " " " " " "	1.75
" " " " " " " " " " " "	10.00

Bound volumes (cloth), \$9.00 to \$10.50, according to date of issue.

**Fromentin's** (Eugène) The Old Masters of Belgium and Holland. 8vo. With eight full-page Heliotypes. Translated by Mrs. Mary C. Robbins. \$3.00.

**Fuller's** (Albert W.) Artistic Homes in City and Country. Fourth Edition. Oblong folio. 76 full-page illustrations. \$4.50.

**Gardner's** (E. C.) Homes and all about them. 3 vols. in 1. Profusely illustrated. 12mo. \$2.50.

**Clark's** (T. M.) Building Superintendence. 8vo. With Plans, etc. \$3.00.

**Hoyt's** (William E.) Household Sanitation. 16mo. 30c. Paper covers. 15c.

**Home Sanitation.** A Manual for Housekeepers. 1 vol. 16mo. 50c.

**Langley's** (Samuel Pierpont) The New Astronomy. Royal 8vo. Gilt top and rough edges. Richly illustrated. \$5.00.

**Morse Collection of Japanese Pottery** (The). By Sylvester Baxter. 4 full-page Heliotypes and numerous Vignettes. Folio, in paper covers. \$1.00.

**Morse's** (Edward S., Ph.D.) Japanese Homes and Their Surroundings. 8vo. With 300 illustrations. \$5.00. Half-calf, \$9.00. New Library edition, \$3.00. In half-calf, \$6.00.

**Picturesque Sketches.** Statues, Monuments, Fountains, Cathedrals, Towers, etc. 1 vol. oblong folio. \$1.50.

**Index** (Decennial) to Illustrations in the American Architect and Building News. 1876-85. 8vo. \$2.00.

**Ware's** (Professor William R.) Modern Perspective. A treatise upon the Principles and Practice of Plane and Cylindrical Perspective. 1 vol. 12mo. With Portfolio of 27 plates. \$5.00.

Sent, post-paid, on receipt of price.

**TICKNOR & CO.,**  
**BOSTON.**



# The Old Bangor Slate Company

F. C. YARNALL, President,  
PHILADELPHIA.

J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawed Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.



## New Combination Dividers.

Forming Dividers with short and long extension points (pencil may be used in connection with either), Outside Calipers, Inside Calipers and Hermaphrodite Calipers.

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard tough, strong, and finely finished.

The joint is large and firm. The quadrant is round and fastened by an improved method. The steel points are tempered by a process which leaves them hard and tough. On the threaded end of the quadrant, between the adjustable legs, is a knurled nut, against the inside of which a helical spring acts. After the points are adjusted the nut may be turned back against the leg, LOCKING IT FIRMLY.

A common pencil fits either socketed leg, while an auxiliary holder is also furnished to fit reversed end of either point. This is one of the most useful combinations of the kind, as well as the BEST MADE tool ever produced.

Send Stamp for Illustrated Price List of Fine Tools for Mechanics.

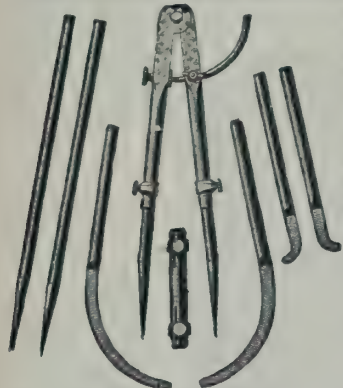
**L. S. STARRETT,**

MANUFACTURER OF

Combination Squares, Caliper Squares, Bevel Protractors, Thread Gauges, Steel Rules, Surface Gauges, Scratch Gauges, &c., &c.

Full Line of Callipers and Dividers, best on the market.

**ATHOL, MASS.**



STARRETT'S NEW COMBINATION DIVIDERS.

## Warren's Natural Asphalt Roofing.

Superior to all others for Flat Roofing.

Over 20,000,000 square feet used within 10 years.

This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.

### "COMPOSITE" FELT.

For Roof Foundations.

A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is absolutely impervious to moisture; for use under slate, shingles, etc., it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete waterproof covering.

Send for samples and Circular No. 2.

WARREN CHEMICAL & MFG. CO. No. 114 John Street, New York.



## GLASS PLATE SHEET & LOOKING GLASS DEPOT

PHILLIP SEMMER GLASS CO. LTD.

No. 12 & 14 DESBROSSES ST. NEW YORK. WRITE FOR QUOTATIONS.

Franklin L. Carter Chas. McWilkins E. Ward Wilkins  
ESTABLISHED 1867.

## PARTRICK & CARTER.

MANUFACTURERS OF AND DEALERS IN EVERY DESCRIPTION OF

# ELECTRICAL SUPPLIES

SOLE PROPRIETORS OF THE  
PATENT NEEDLE ANNUNCIATORS AND BURGLAR ALARMS  
WE MAKE A SPECIALTY OF  
BELLS, DISQUE LECLANCHE BATTERIES GAS-LIGHTING APPARATUS  
AND A FULL LINE OF  
SUPPLIES FOR ELECTRIC BELL WORK  
WE PUBLISH CATALOGUES OF ALL OUR MANUFACTURES AND WILL FORWARD TO ANY ADDRESS UPON APPLICATION.  
WHEN APPLYING FOR CATALOGUES PLEASE STATE WHETHER ELECTRIC BELL OR GENERAL ELECTRICAL SUPPLY CATALOGUE IS WANTED, AND IF IN THE TRADE INCLOSE BUSINESS CARD FOR DISCOUNTS.

114 SOUTH SECOND STREET. PHILADELPHIA, PA.

# ADAMANT

WALL PLASTER.

MANUFACTURED BY

Adamant  
Manufacturing  
Company.

OFFICE

63 EAST GENESEE STREET,  
SYRACUSE, N. Y.

## The New, Cheap, and Only Superior Substitute for Common Plaster.

It is hard as marble, and will last as long as the building.

It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.

It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.

It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.

It does not crack or fall off, even in case of leakages.

It is applied easily by any good mason.

It is the only material with which repairing can be done neatly and "to stay."

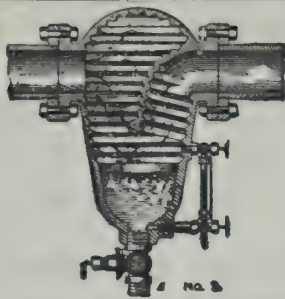
For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,

For Pennsylvania, KEYSTONE PLASTER CO., 233 No. 23d St., Philadelphia,  
or, " " " Williamsport, Pa.

For Massachusetts and Rhode Island, BAY STATE ADAMANT CO., 164 Devonshire St., Boston, Mass.

For Connecticut, CONNECTICUT ADAMANT CO., 480 Grand Avenue, New Haven, Conn.

For New Jersey, NEW JERSEY ADAMANT CO., 61 Passaic Avenue, Harrison, N. J.



## HINE'S ELIMINATOR

FOR EXTRACTING

OIL, GREASE and DIRTY WATER from EXHAUST, and WATER from LIVE-STEAM before entering the Heating Pipes and Radiators.

Enhancing heating capacity. Doing away with unpleasant odor incident to old system, and returning the condensation to boiler free from all injurious properties.

Also Manufacturers of

DAMPER REGULATORS and REDUCING VALVES.

HINE & ROBERTSON, 47 Cortlandt St., N. Y.

Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.

**J. DUNFEE & CO.,**  
Wood Carpet and Weather Strips

OF ALL KINDS,

102 Washington Street, - - CHICAGO.

SEND FOR CATALOGUE.

Factory, 204 to 212 South Clinton Street.

GAS MOTORS AND PRODUCERS.—Description by C. W. Siemens of a new apparatus for producing gas, and of a new motor to be driven therewith. With 2 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 324. Price 10 cents. To be had at this office and from all newsdealers.

The New Catalogue of Valuable Papers

contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.

MUNN & CO., 361 Broadway, N. Y.

DETROIT, MICH, June, 1888.

DEAR SIR:

You are a user of tools. In purchasing you consider the quality, the time of delivery, and the price. We understand your position and solicit your orders.

We are in the Tool and Light Machinery business, and carry a full line of what we term Standard Tools, all of the best quality.

For special tools we offer you the advantages of a large and complete variety, comprising all of the latest improved and patented novelties and labor saving articles, and the largest line carried in the United States.

Our catalogue of tools, which is the most complete one ever issued (contains 200 pages and over 700 illustrations), will be mailed to any address upon receipt of 8 cents in stamps for postage.

Increase of business and duplicate orders from all parts of the country show that our prices are satisfactory.

We hope to receive at least a sample order from you, and will give same our careful and prompt attention. If you do not see your way to ordering at once, we invite your correspondence, and will consider and do all we can to remove any obstacles that you may see in the way.

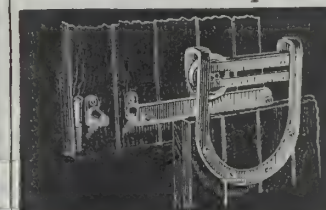
Yours respectfully,

CHAS. A. STRELINGER & CO.

 <b>THE BACKUS WATER MOTOR</b>	 <b>THE BACKUS MOTOR</b> Is the cheapest power known for driving all kinds of light machinery. Thousands in use the world over. Speak for themselves. Sold with or without a governor. It is noiseless, neat, compact, and runs without attention.  <b>THE BACKUS EXHAUSTER</b> A wonderful Air Mover. Invaluable for ventilating factories and public buildings. Will remove smoke, dust, steam, foul air, acids, and is used for drying, heating or cooling. Send for Special Catalogue. <b>BACKUS WATER MOTOR CO., Newark, N. J.</b>	 <b>THE BACKUS EXHAUSTER</b>
-----------------------------------	---	---------------------------------

## LANE'S PATENT STEEL DOOR HANGER

The most perfect Anti-Friction Hanger in the Market.



**BECAUSE**  
It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

**LANE'S PATENT TRACK**  
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

Manufactured by **LANE BROS.,** Poughkeepsie, N. Y.  
JOHN H. GRAHAM & CO., General Agents, 113 Chambers St., N. Y.  
SOLD BY HARDWARE DEALERS GENERALLY.



**PANCOAST & ROGERS,**

GENERAL AGENTS FOR

READING IRON WORKS, Wrought Iron Pipe, Boiler Tubes, Artesian and Oil Well Tubing, Casing, Line Pipe, etc. Special work of every kind in Wrought Iron.

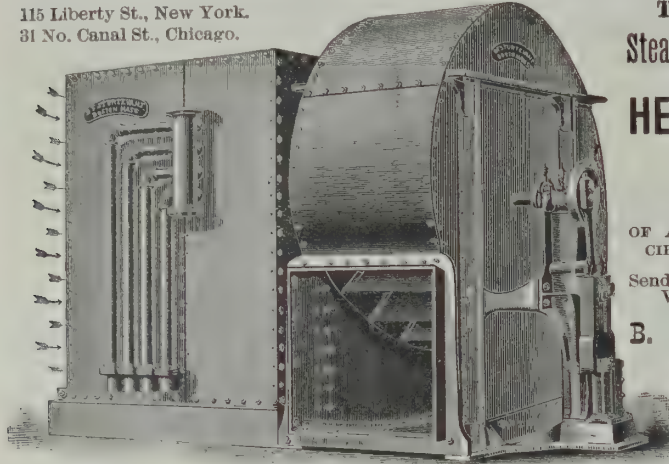
CHAPMAN VALVE MFG. CO. Valves and Gates for Gas, Steam, Water, Oil, etc., 1/4" to 48" diam. Fire-Hydrants.

THE WATERBURY MALLEABLE IRON CO. Malleable and Gray Iron Fittings for Gas, Steam, and Water.

MANUFACTURERS' AGENTS FOR

CAST IRON WATER &amp; GAS PIPES, SPECIAL CASTINGS, And Dealers in Supplies of Every Description.

Office &amp; Warehouse, 28 Platt &amp; 15 Gold Sts., New York.

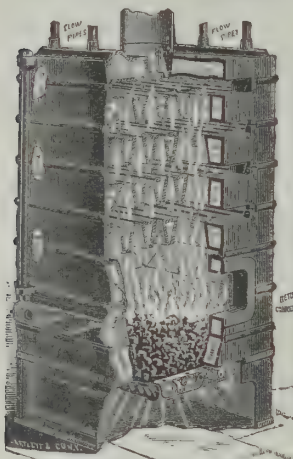
115 Liberty St., New York.  
31 No. Canal St., Chicago.THE STURTEVANT  
Steam Hot Blast Apparatus

FOR

HEATING and  
VENTILATING  
BUILDINGSOF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.Send for Illustrated Treatise on  
Ventilation and Heating.B. F. STURTEVANT,  
BOSTON, MASS.

BRANCHES:

New York. Chicago.



"PERFECT"

TRADE MARK

Hot Water  
Heater.

Hot Water, as a medium for heating Private and Public Buildings, is largely engrossing the attention of the public, as being more satisfactory and certain in its operation, and more easily managed than Steam. Having constructed a Hot-Water Heater that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

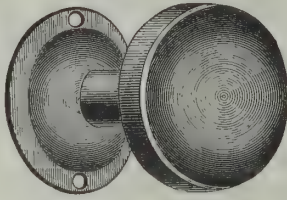
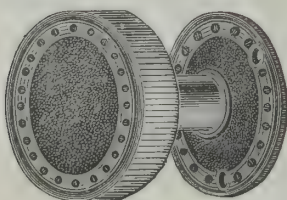
Richardson & Boynton Co., Mrs.,  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.**The Globe Steam Heater**Has been thoroughly tried  
in many private and public  
buildings and always found  
to be the best. Very econom-  
ical, and easily managed.Large surface exposed directly to the fire. Ask for all  
particulars before you place your order for any other.THE GLOBE SAFETY DAMPER REGULATOR SHOULD  
BE USED ON EVERY STEAM HEATER IN USE.

For new Illustrated Price List of Globe Steam Heating Appliances, address

Globe Steam Heater Co., North Wales, Pa.

**HEMACITE.**Easily the Best and  
Handsomest  
Interior Door-Handle

Address

DIBBLE MFG. CO.,  
Trenton, N. J.**THE IMPROVED  
Auburn Boiler**

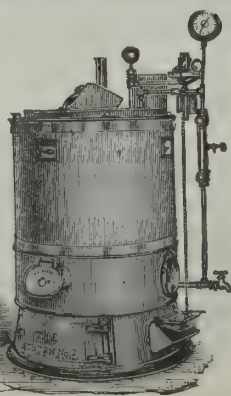
—FOR—

Steam or Hot Water.

AUTOMATIC, SELF-FEEDING, PORTABLE.

Requires attention but once in from  
twelve to twenty-four hours. Fuel  
magazine surrounded by water. Self-  
locking shaking grate. Waste of coal  
impossible. No dust. No gas.

Woodcock &amp; Co., Auburn, N. Y.



HEATER.

**THE  
Woodcock Patent Shaking Grate,**

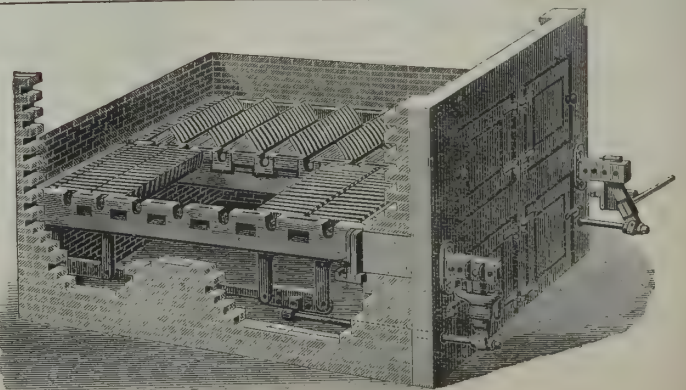
FOR

BOILER FURNACES  
OF ALL DESCRIPTIONS.

Saves its cost in a year, supplanting  
all other shaking grates. No waste of  
coal. No burnt or broken grates. Self-  
locking, and as nearly automatic as  
grate can be made.

Send for Illustrated Catalogue.

Woodcock &amp; Co., Auburn, N. Y.



WOODCOCK PATENT SHAKING AND DUMPING GRATE.

**THE BOYNTON FURNACE CO.**

207 &amp; 209 WATER STREET, NEW YORK;

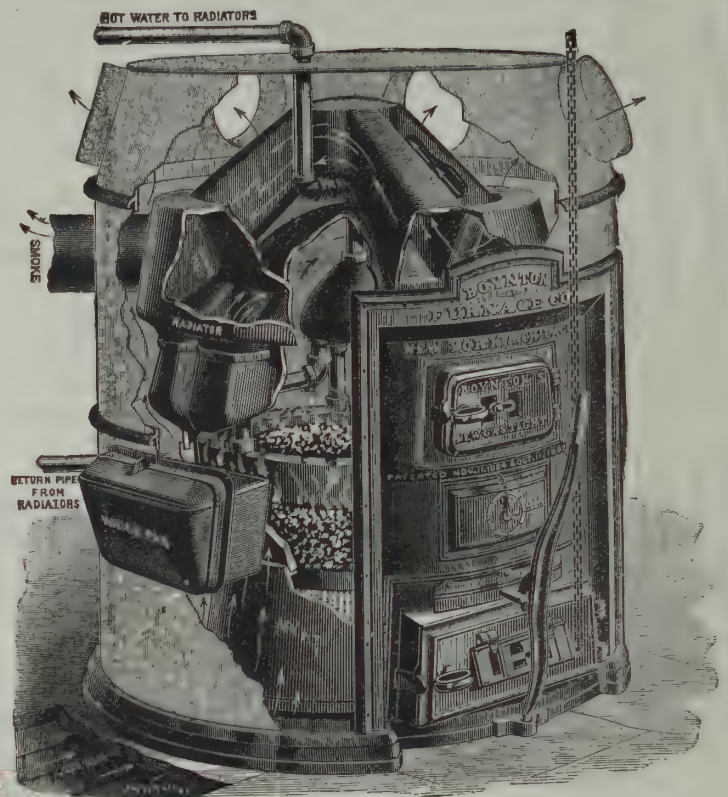
47 &amp; 49 DEARBORN STREET, CHICAGO, ILL.,

—SOLE MANUFACTURERS OF—

Boynton's "New Gas Tight" Self-Clearing Hot Air  
Furnace with Hot Water Combination.

Patented October 11th, 1887.

THOROUGHLY TESTED, AND NO EXPERIMENT!



Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

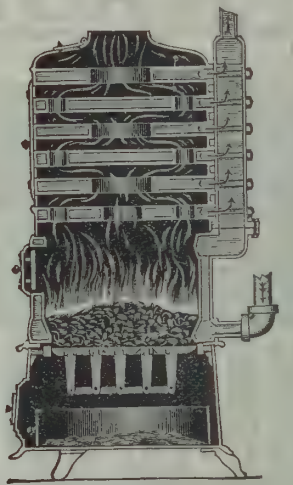
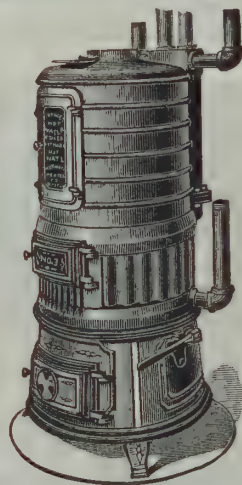
The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The HOT WATER HEATER is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or all Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.



SEND FOR DESCRIPTIVE CIRCULARS.

National Hot Water Heater Company,

MANUFACTURERS OF

**The Spence Hot Water Heaters,**

191 Fort Hill Square, Boston, Mass.

ESTABLISHED 1836.

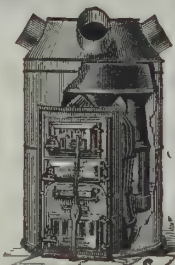
**BARSTOW STOVE COMPANY,**

—MANUFACTURERS OF—

Cast Iron and Steel Plate Furnaces,  
Portable and Brick Set Ranges, Parlor  
Stoves, and Baltimore Heaters.

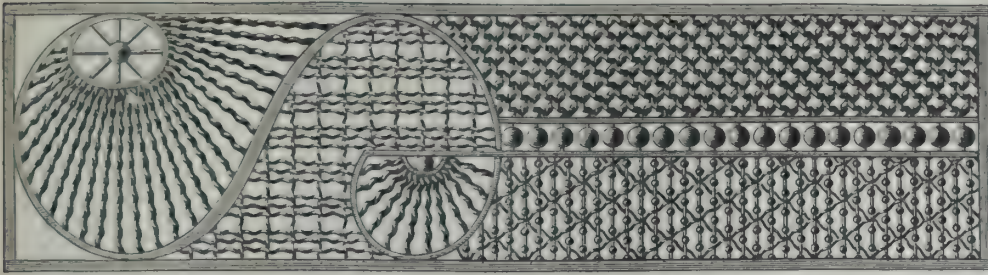
SEND FOR ILLUSTRATED CATALOGUE.

BARSTOW STOVE CO.,

230 Water Street, NEW YORK; 56 Union Street, BOSTON;  
PROVIDENCE, R. I.



## That Beautiful, Ornamental and Decorative Woodwork



FOR DOORS, TRANSOMS, ARCHES AND WINDOWS, KNOWN AS  
**MOORISH FRET WORK,**  
IS MANUFACTURED ONLY BY

**C. S. RANSOM & CO.,**  
**CLEVELAND, O.**

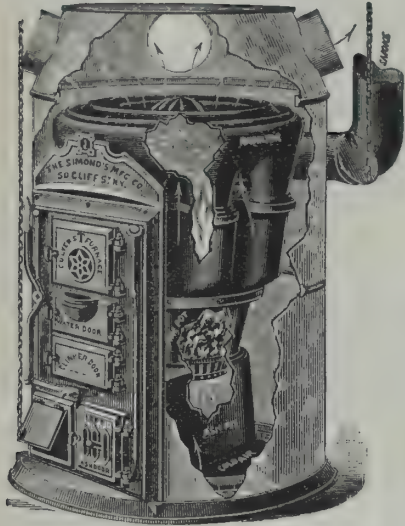
There is no limit of design into which this work can be made. It is made of any domestic or imported woods, finished natural, stained, or in white and gold or bronzes. All leading decorating, drapery or furniture houses will supply you. Patented as an article of merchandise September 15, 1885.

New York Office, 5 West 27th Street.

Established 1845.

# THE SIMONDS MANUFACTURING CO.

50 Cliff Street, New York.



Furnaces,  
Ranges,  
AND Registers.

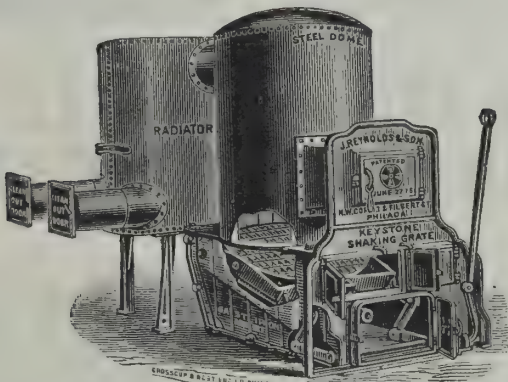
SEND FOR

Catalogues and Price Lists.

"The Best is the Cheapest."

"A Perfect Furnace at Last."

Keystone Steel Furnaces,  
Air Tight Steel Furnaces,  
Manufactured by J. REYNOLDS & SON,  
13th and Filbert Sts., Philadelphia.



These Furnaces are supplied with **THE "REYNOLDS CLINKER CUTTING GRATE"** with Patent Dumping Attachment, the best **LABOR** and **FUEL SAVING** invention ever applied to **HEATING APPARATUS**. It is perfect. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly **GAS, SMOKE** and **DUST TIGHT**.  
**SEND FOR CIRCULAR.**

## Black Diamond Steel Dome Furnaces.

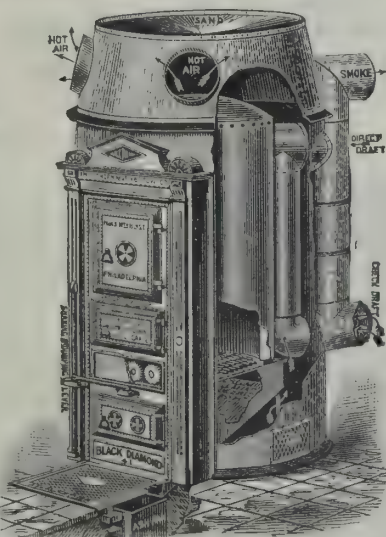
ALL SIZES.

Patent Self-Cleaning Ash Pit

Obviates labor, dirt, and annoyance. Sure preventive from fire caused by hot ashes.

Patented and Manufactured by

**The Schoen Heater**  
and Stove Co.



PORTABLE and  
BRICK SET.

Common Sense Clinker-Crushing Grate. Great saving of labor and fuel.  
Perfect Dump

Office and Salesroom

**13 North Eleventh St.**  
Philadelphia.

**SEND FOR ILLUSTRATED CATALOGUE.**  
**AGENTS WANTED IN EVERY TOWN.**

*J. Rayner*  
IMPORTER AND MANUFACTURER  
**MAHOGANY**  
CABINET WOODS AND VENEERS.  
FOOT EAST HOUSTON ST NEW YORK. | FULTON & MORGAN STS CHICAGO ILL.

## IMPORTANT

To Architects, Builders, House-Painters, Decorators, Boat-Builders and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Varnishes or Wood-Finishes in the market, for the following reasons, viz:

They possess more body, higher luster, greater resisting properties to atmospheric influences, action of water and alkali, are more elastic, will not scratch or mar white, and are more durable.

WORKS:

734-740 East 14th Street,  
733-739 East 13th Street,  
199-207 Avenue D.



For all classes

Inside Work,

Requiring great durability, use No. 2 ELASTICA FINISH.

For

Outside Work,

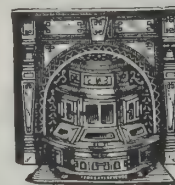
Requiring extreme durability, use No. 1 ELASTICA FINISH.

Manufactured by

**STANDARD VARNISH WORKS,**

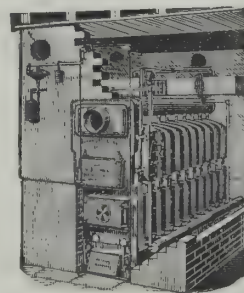
**D. ROSENBERG & SONS,**

Office, 207 Avenue D, NEW YORK.  
Send for Samples and Full Particulars.



**BIBB'S** Celebrated Original  
**BALTIMORE**  
**FIRE-PLACE HEATERS**  
To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world. THE B. C. BIBB STOVE CO. Stove Founders, Baltimore, Md. MARBLEIZED SLATE MANTELS. Send for Circulars and prices.

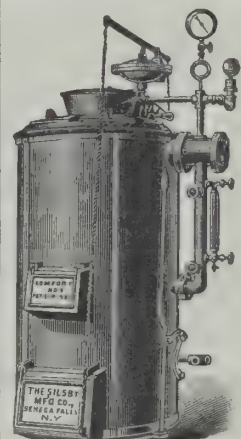
Steam & Hot Water Heating Apparatus  
For Public Buildings, Residences, Etc.



Our Specialties:  
The Union Hot Water Radiator;  
Gold's Patent Sectional Boiler;  
M. I.'s Patent Safety Boiler;  
Reed's Cast-Iron Radiators; Indirect Pin Radiators.

The H. B. Smith Co.  
137 Centre St., New York.  
Foundry, Westfield, Mass.  
Send for Circulars.

## STEAM HEATERS.



The most Reliable, Durable, and Economical in the market.

Simple, Cheap, Safe.

Require no brick work.

Are absolutely automatic.

A servant or child can manage them.

Send for Illustrated Catalogue.

**The Silsby Manuf'g Co.,**  
**221 FALL STREET,**  
**SENECA FALLS, N. Y.**

## ARCHITECTURAL PERSPECTIVES.

Architects and Builders who have plans which they desire to have put in perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

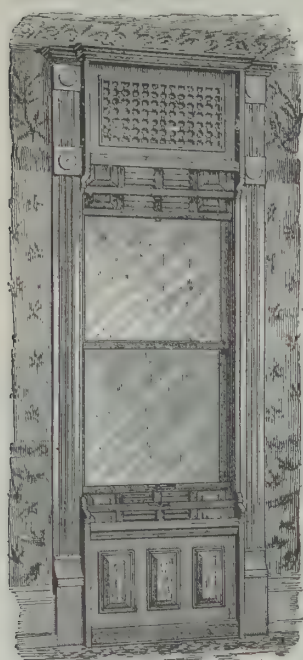
MUNN & CO., Scientific American Office, 361 Broadway, New York.



Eight Foot Eave Trough and Gutters.  
**HATTEN, GALPIN & CO., BINGHAMTON, N. Y.**

**HATTEN, GALPIN & CO.**





## WILLER'S PATENT INSIDE SLIDING BLINDS

ARE ACKNOWLEDGED THE  
STANDARD SLIDING BLINDS  
OF THE COUNTRY.

They are used in preference to any other  
by the  
**LEADING ARCHITECTS.**

THEY ARE THE ONLY SLIDING BLINDS GIVING  
Universal Satisfaction.

For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**  
Sole Manufacturer,

*Fourth and Cedar Streets, Milwaukee, Wis.*  
**AGENTS WANTED EVERYWHERE.**

State your business when writing for catalogue or agency.

## ARCHITECTURE.

An Encyclopædia of COTTAGE, FARM, and VILLAGE ARCHITECTURE and FURNITURE, containing numerous Designs for Dwellings, from the Villa to the Cottage and the Farm, including Farm Houses, Farmeries, and other Agricultural Buildings, Country Inns, Public Houses, Parochial Schools; with the requisite Fittings Up, Fixtures, and Furniture, and appropriate Offices, Gardens, and Garden Scenery. By J. C. LOUDON, F.L.S., H.S., G.S., Z.S. Illustrated by more than 2,000 engravings, over 1,300 pages. Sent by mail or express on receipt of \$5.00.

Address

**MUNN & CO., 361 Broadway, New York.**

EDWARD FORD, PREST.  
A. PITCAIRN, VICE-PREST.

E. L. FORD, SECY.  
JOHN F. SCOTT, TREAS.

## PITTSBURGH PLATE GLASS CO., CREIGHTON, PA.,

MANUFACTURERS

## POLISHED PLATE GLASS.

Ground and Rough Plate Glass for Floors and Skylights.

Three-sixteenths thickness, made expressly for fine residences.

### LARGE AND WIDE GLASS A SPECIALTY.

The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.

## IMMENSE PRODUCTION.

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.

The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.

—CORRESPONDENCE SOLICITED.—

Works No. 1,

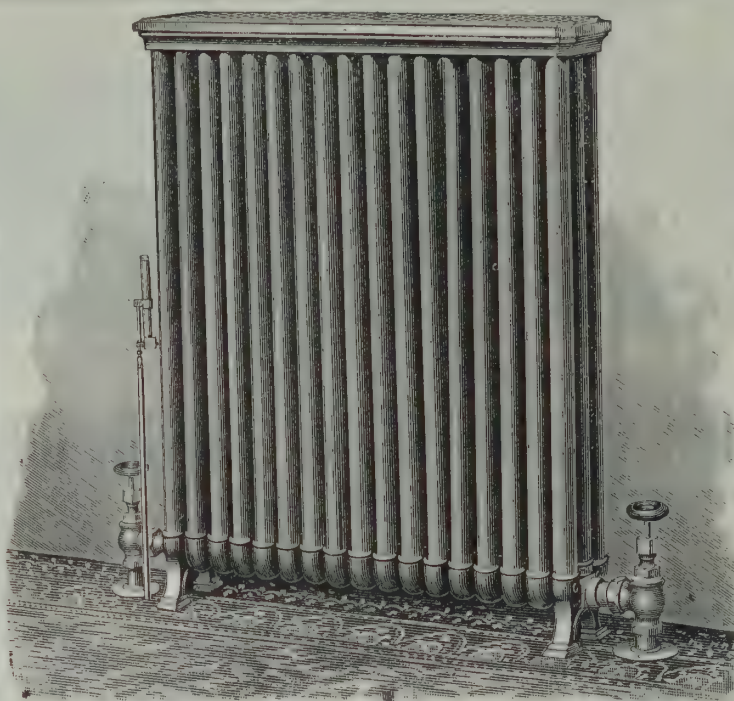
**CREIGHTON, PA.**

Works No. 2,

**TARENTUM, PA.**

WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL  
OFFICE, CREIGHTON, PA.

**THE BRIDGEPORT WOOD FINISHING CO**  
G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN.  
NEW YORK BUSINESS OFFICE, 96-98 MAIDEN LANE, MANUFACTURERS OF  
**WHEELERS PATENT WOOD FILLER.**  
BREINIG'S LITHOGEN SILICATE PAINT  
LITHOGEN PRIMER, WOOD STAINS  
SILEX FLINT AND FELDSPAR.  
PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.



**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
STEAM HEATING ENGINEERS.

Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.

## ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

**MUNN & CO., Publishers,**  
361 Broadway, New York.

## HARTMAN'S PATENT INSIDE SLIDING WINDOW BLIND.



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

Agents wanted everywhere.

Send for illustrated Catalogue and prices to

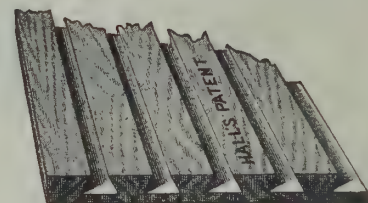
**Hartman & Durstine,**  
WOOSTER,  
Ohio,  
Mfrs for U. S. A.

**Withrow & Hillock,**  
TORONTO, Can.,  
Mfrs. for the Dominion of Canada.

## HOW TO BUILD A PERFECT HOME WITH VERY LITTLE COST.



USE  
COMBINED  
SHEATHING  
LATH.



It makes a cheaper, warmer and stronger house than brick or stone. It is a dry and therefore a healthy house. The plaster will not crack. Architects and Builders specify it all over the country.

ADDRESS

**The Byrkit-Hall Sheathing Lath Co.,**

226-228 LA SALLE STREET, Room 28, CHICAGO, ILL.

For Eastern and New England States, address

**I. C. JENKINS, OSWEGO, N. Y.**



—THE—  
**Timby Burglar-Proof  
SASH LOCK  
AND  
VENTILATOR.**

One Lock only required for a Window. It locks either or both sash securely in any position desired, thereby affording the means of Perfect Ventilation; also absolute security against Burglars and Sneak-Thieves.

Its simplicity, automatic action, strength, ventilating qualities, and adaptability to varying thicknesses of sash or inside stops, render it more desirable than any other Sash Lock now offered in the market.

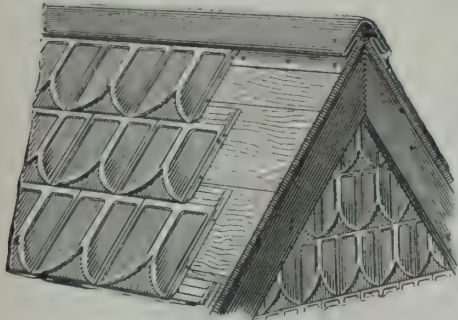
Manufactured from the Best Malleable Iron, Steel, Brass and Bronze Metal.

**Jenkins & Timby,**  
Manufacturers,  
OSWEGO, N. Y.



# THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.



Our Gothic Shingle and Plain Ridge Coping.

## TILES.

**NEW PRINCIPLE.** Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

## SHINGLES.

**Gothic Pattern.** The BEST SHINGLE ever offered to the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

Illustrated Catalogue mailed to any address an application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.

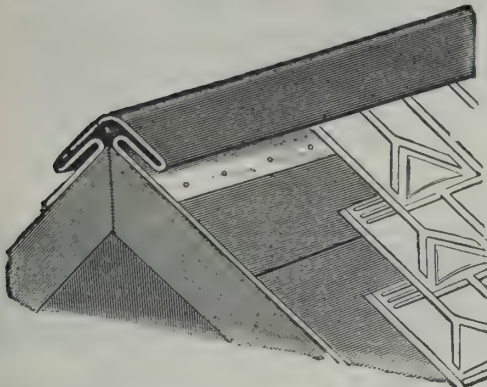


Shield Tiles as laid on roof with Roll Ridge Coping.

# Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

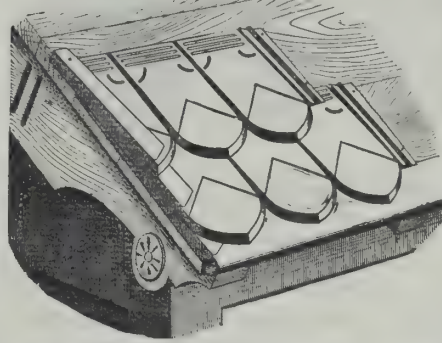
A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Walter's Patent Standard Metallic Shingles.

## WHOLESALE AGENTS.

W. W. MONTAGUE & CO., San Francisco, Cal., Pacific Coast.  
PHILLIPS & BUTTRESS MFG. CO., Nashville, Tenn.  
MCDONALD, KEMP & CO., Toronto, Sole Agents, Canada.  
KNISELY & MILLER, Chicago, Ill.  
J. J. WALTERS, Denver, Col.  
JEROME TWICHELL & CO., Kansas City, Mo.

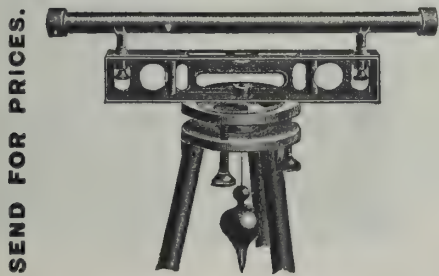


Cooper's Patent Queen Anne Metallic Shingles.



THE NATIONAL SHEET METAL ROOFING CO.,  
510, 512, 514, 516, 518 & 520 East 20th St., New York.

## LEVELING INSTRUMENT.



C. F. RICHARDSON,  
ATHOL, MASS.,  
Manufacturer of Metal Levels.

## HYATT HOUSE FILTERS.

Over 1,000 of them operating daily in residences, producing continuously

BRIGHT, SPARKLING WATER.

Hyatt Pure Water Company,  
18 CORTLANDT ST.,  
NEW YORK.



**HOMES**  
OF  
**TO-DAY**  
Or, MODERN  
EXAMPLES OF  
MODERATE  
COST  
HOUSES

Published in one annual and three quarterly parts. Annual part now ready, 96 large quarto pages, 30 designs of buildings costing \$250 to \$12,000; nearly 200 illustrations; colored frontispiece, and full set framing plans and details of country house. A complete hand-book for those intending to build. Price, Annual Part, 50c. Each Quarterly Part, 25c. The four parts postpaid, \$1.00. F. L. SMITH, Architect, 22 School St., BOSTON.



**COZY HOMES**  
How to Build Them.  
Contains 96 pages, showing complete designs of 10 low-cost houses, with valuable information for those who wish to build economically. The book will be mailed, post-paid, on receipt of Price, 25 Cents. Postal note, or 1 and 2 ct. stamps.

F. L. SMITH, Architect, 22 School St., BOSTON.

# PEERLESS BRICK CO.

PHILADELPHIA, PA.  
1003 WALNUT ST.  
WORKS—70 Acres—Old York Road and Nicetown Lane.



PLAIN, PRESSED FRONT, ORNAMENTAL & MOLDED  
**BRICKS**  
MADE OF  
THOROUGHLY TEMPERED CLAY.  
16,000,000 Bricks Annually.  
5,000,000 Pressed Front Bricks,  
**600 DIFFERENT DESIGNS AND SHAPES.**

VARIOUS SIZES, COLORS, AND SHADES. } Red, Buff, Drab, Brown, Gray, Black, White and Pompeian.  
Orders filled for large quantities of Pressed Front or Face Bricks of any one shade.  
**BRICK FIRE PLACES AND MANTELS.**  
ARCHES of all kinds ground and fitted from drawings furnished to us. Full size working plans sent with bricks.  
**SPECIAL SHAPES** made from designs furnished us by Architects. Bricks shipped in cars at our works for all parts of the country. Illustrated Catalogue and Price List sent on application.

# E. P. WILCE & CO.,

MANUFACTURERS OF

## DOORS, SASH AND BLINDS

FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

Stair Work and Interior Finish, Mantels, Sideboards, Pulpits, Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets, CHICAGO.

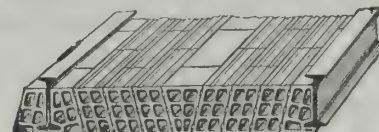
# PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-one years experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.  
MUNN & CO., Solicitors of Patents,  
361 Broadway, New York.  
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



(Iron Beam Protection. Patented June 3, 1884.)  
**HENRY MAURER & SON,**  
MANUFACTURERS OF  
**FIRE-PROOF MATERIAL**  
Of every description. Hollow Brick made of Clay for Flat Arches, Partitions, Furring, etc. Porous Terra Cotta, Fire Bricks, etc., etc.  
Office and Depot, 420 East 23d St., New York.  
WORKS, PERTH AMBOY, N. J.

**A NEW CATALOGUE**  
—OF—  
**A VALUABLE PAPERS**  
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.  
MUNN & CO., 361 Broadway, New York.

## SEALED PROPOSALS.

Sept. 7, 1888. Sealed Proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 9th day of October, 1888, for the labor and materials required in the erection of the basement area walls, first floor beams, etc., of the U. S. Court House, Post Office, etc., at Los Angeles, Cal., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Milwaukee, Wisconsin, Oakland, Cal., and San Francisco, Cal., the Builders' and Traders' Exchanges at Chicago, Ill., Denver, Col., Kansas City, Mo., and Louisville, Ky. Each bid must be accompanied by a certified check for \$300.00. The Supervising Architect will furnish copies of the specification and drawings at \$2.00 a set, upon receipt of that sum in Post Office Money Order, drawn to the order of the Treasurer of the United States. Only a limited number of sets are for sale.  
WILL A. FRERET, Supervising Architect.

September 13, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 9th day of October, 1888, for the labor and materials required in the completion of the approaches of the Court House, Post Office, etc., at Nebraska City, Nebraska, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Cincinnati, Ohio, and Wichita, Kan., and the Builders' and Traders' Exchanges at Chicago, Ill., Denver, Col., Kansas City, Mo., and Louisville, Ky. Each bid must be accompanied by a certified check for \$200. The Supervising Architect will furnish copies of the specification and drawings to a limited number, at \$200 a set, upon receipt of that sum, in post office money order, drawn to the order of the Treasurer of the United States. WILL A. FRERET, Supervising Architect.

Screw Plates.

Adjustable Die.

Send for CATALOGUE F. F. F.

GREENFIELD, MASS.

**WELLS BROS. & CO.,**  
MANUFACTURERS OF  
Screw Cutting Machinery and Tools for Machinists, Carriage Makers, and Blacksmiths' Use.

# THE ANDERSON

PRESSED FACE, SHAPE AND ORNAMENTAL  
**BRICK,**

in Red, Buff, Brown, Drab, Old Gold, Obsidian, Pink, Black, White, Garnet, Blood Stone, Onyx, Mottled, Drused, Marbled, Roman, Ashlar, etc., are pronounced by Architects, in strength, texture, uniformity of size, color, shades, perfect shape, angles, and lines, the finest in the world, surpassing everything in the art.

## THE ANDERSON COMPANIES

are the largest manufacturers in fine grades of PRESSED BRICK in this country or abroad.

Architects and Builders can obtain illustrated catalogue and any desired information, on application to the nearest Company.

CHICAGO ANDERSON PRESSED BRICK CO., Office, 189-191 La Salle St., Chicago.

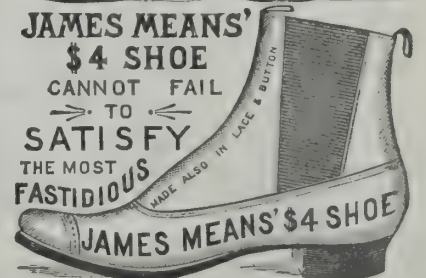
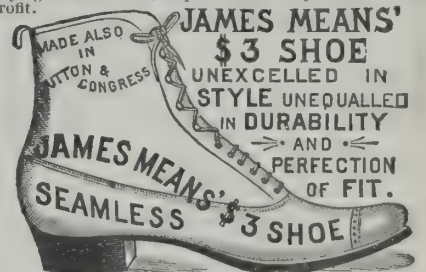
NEW YORK ANDERSON PRESSED BRICK CO., Office, 132 Mangin St., New York.

NEW ENGLAND ANDERSON PRESSED BRICK CO., Office, 50 Bromfield St., Boston.

# The March of Progress!

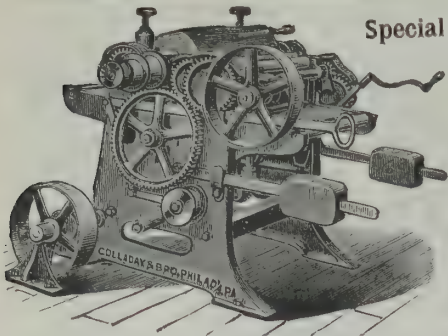
## OUR LATEST IMPROVEMENT!

"Competition is the life of trade," and if you have not seen our improved \$3 Shoe, made for the Summer and Fall trade of 1888, you cannot imagine how lively trade is, or how hard our competitors have to work to keep within sight of us. Ask your retailer for the James Means' \$3 Shoe, or the James Means' \$4 Shoe, according to your needs. Positively none genuine unless having our name and price stamped plainly on the soles. Your retailer will supply you with shoes so stamped if you insist upon his doing so; if you do not insist, some retailers will coax you into buying inferior shoes upon which they make a larger profit.

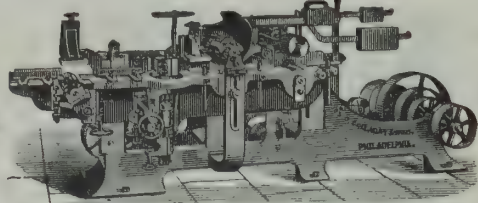


Such has been the recent progress in our branch of industry that we are now able to affirm that the James Means' \$4 Shoe is in every respect equal to the shoes which only a few years ago were retailed at eight or ten dollars. If you will try on a pair, you will be convinced that we do not exaggerate. Our original \$3 and \$4 Shoes, and those who imitate our system of business are unable to compete with us in quality of factory products. In our lines we are the largest manufacturers in the United States. Shoes from our celebrated factory are sold by wide-awake retailers in all parts of the country. We will place them easily within your reach in any State or Territory if you will invest one cent in a postal card and write to us, mentioning the SCIENTIFIC AMERICAN.  
James Means & Co., 41 Lincoln St., Boston, Mass.



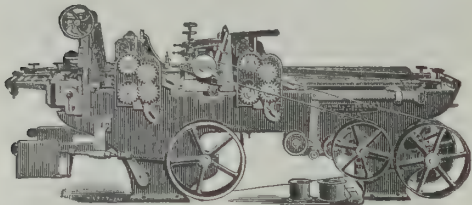


Special Wood Working Machinery

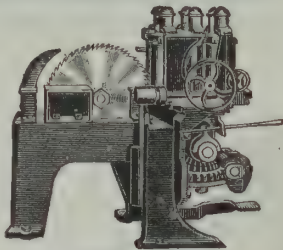


For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc.  
 Manuf'd by **Joseph O. Colladay & Bro.,**  
 Nicholson & Race Street, Philadelphia.

**Woodworking Machinery, Planers and Matchers, Pony Planers, Hand Matchers, Solid Plate and Segment Re-Saws.**

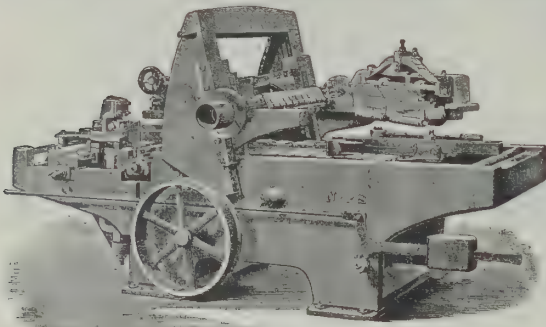


PLANER AND MATCHER.



SIDING SAW.

**CONNELL & DENCLER, Rochester, New York.**



**HOYT & BROTHER CO.**  
**AURORA, ILL.**  
 MANUFACTURERS OF

**Machinery for Working Wood.**

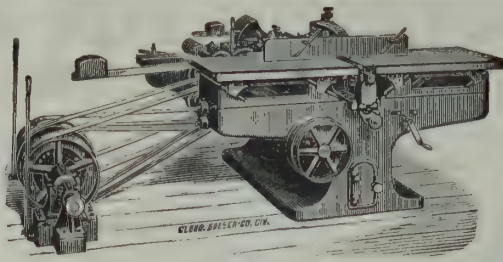
Planing Mill Machinery  
 a Specialty.

Send for Catalogue.

## USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,

**MUNN & CO., 361 Broadway, New York.**



WOOD WORKER SIDE.

**COMBINED**  
**Universal Wood Worker and Molder.**

Two machines on one frame, driven by one countershaft, and arranged so that they can be run together or separately.

Address,

**The Egan Company,**  
**-BUILDERS OF-**

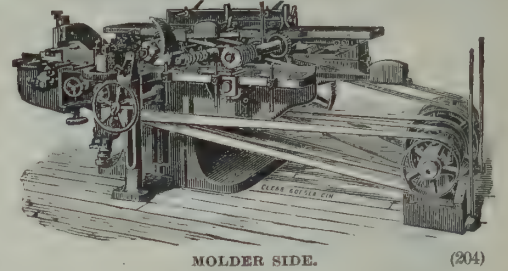
**WOOD WORKING MACHINERY,**

209 to 229 W. Front St., Cincinnati, Ohio, U. S. A.

We build the largest and most complete line of improved Wood Working Tools in the U. S. for Carpenters, Builders, Planing Mills, and General Wood Workers.

Complete Outfits Furnished.

Write for Catalogue and Quotations.



MOLDER SIDE.

(204)



Sectional Panel Ornamental Grille Work.

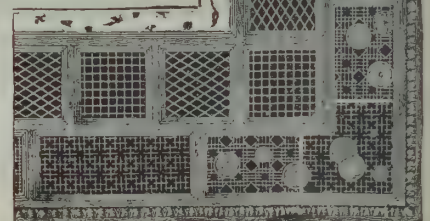
**CUTTING & DE LANEY,**  
**Buffalo, N. Y.,**  
**ARTISTIC**  
**Wood Workers.**

East Indian, Japanese, and Moorish

Decorative Lattice.  
 Special Designs To Order.

**FINE CARVED**  
**Furniture.**

Place of Border Calling  
 of Decorative Lattice.



**"Alsop" Warm-Air and Combination Warm-Air and Steam Furnace**  
**THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.**

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

**IN OFFERING** this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a *new departure* in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

**This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation.**

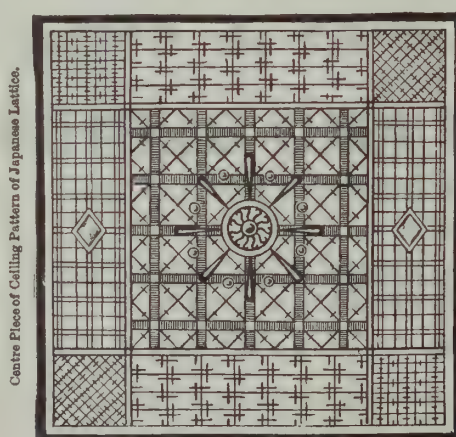
**Manufactured by the ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.**



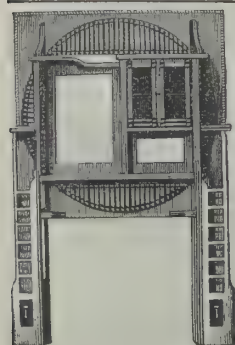
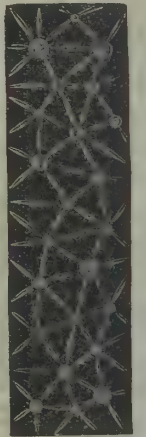
**MANAHAN'S**  
**Waterproof Parchment,**  
**Strongest and Lightest Sheathing.**

One Dollar's worth covers more ground than same amount of most sheathing. *Send for Samples.*

**HALLETT BROS., Sole Agents,**  
**290 Devonshire St., BOSTON.**



Centre Piece of Ceiling Pattern of Japanese Lattice.



**Mankey Decorative Company,**  
**Williamsport, Pa.,**  
 CAPITAL \$100,000.

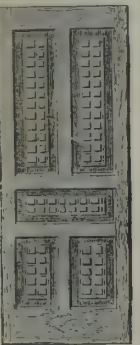
Incorporated Sept. 9, 1885.

—MANUFACTURERS OF—

**Artistic Wood Decorations for Public and Private Buildings**

MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

**WOOD MANTELS and DOORS A SPECIALTY.**



# ART STAINED GLASS

FOR CHURCHES, DWELLINGS, Etc.

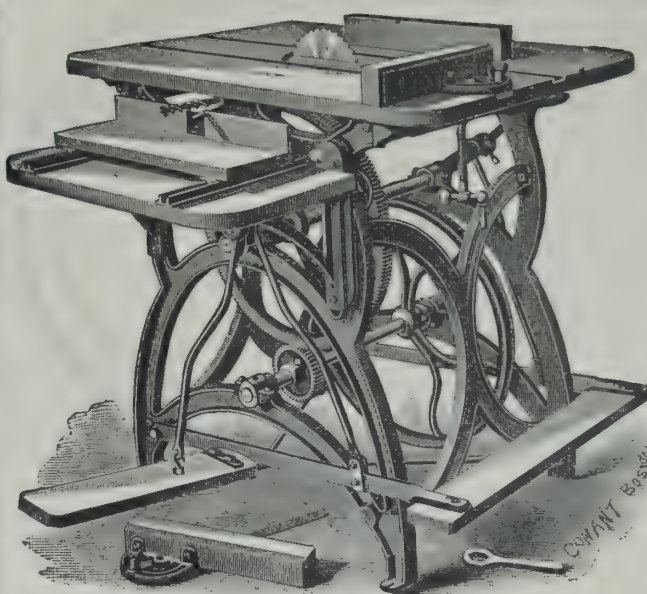
**Keystone Stained Glass Works,**  
 271 SOUTH 5th ST., PHILADELPHIA.



NORTHROP'S PATENT paneled iron ceiling.



Far surpassing either plaster or wood ceilings. These ceilings can be laid over old broken plaster as well as on new work. These ceilings are covered by 6 original patents. Send for Illustrated Circulars and Price Lists.  
A. NORTHROP & CO., Sole Manufacturers, Pittsburgh, Pa.



MARSTON'S  
Hand & Foot Power  
Circular Saw.

Iron frame 36 inches high. Top 30 x 40 inches, centre part of iron with planed grooves on each side of saw for cutting off gauges to slide in. Ripping gauge slides in iron groove. Steel shafts. Gears are all machine cut from solid iron. Working table and side treadle. Two 6-inch saws and two cranks with each machine. Weight 850 pounds.

Send for price list.

J. M. Marston & Co.  
Cor. Appleton & Tremont Sts.,  
BOSTON, MASS.

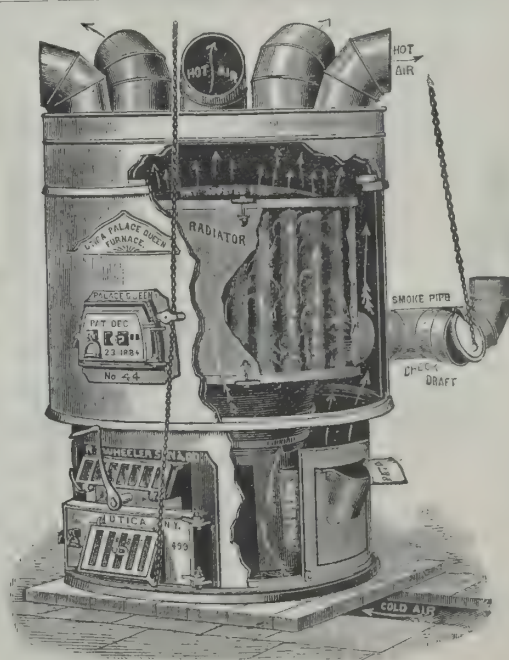
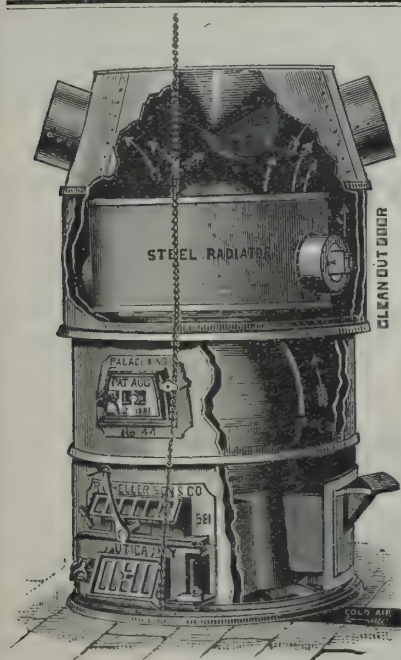
Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

<b>Adjustable Planes.</b> Stanley Rule & Level Co. .... cover ii	<b>Brick.</b> Chicago Anderson Pressed Brick Co. .... xi Peerless Brick Co. .... xi	<b>Decorative Lattice.</b> Cutting & De Laney ..... xii C. S. Ransom & Co. .... ix	<b>Foot and Hand Power Machinery.</b> W. F. & J. Barnes Co. .... ii C. E. Little ..... ii J. M. Marston & Co. .... xiii Sebastian May & Co. .... vi Seneca Falls Mfg. Co. .... ii
<b>Advertising Glass Signs.</b> The Western Sand Blast Co. .... iii	<b>Brick Machinery.</b> Henry Martin ..... v	<b>Door Knobs.</b> Dibble Mfg. Co. .... viii	<b>Furnaces.</b> Abram Cox Stove Co. .... cover iii Barstow Stove Co. .... viii Boydton Furnace Co. .... viii Alsop Furnace and Stove Co. .... xii E. A. Jackson & Bro. .... cover ii Leibbrandt & McDowell Stove Co. .... i J. F. Pease Furnace Co. .... i J. Reynolds & Son ..... ix Richardson & Boydton Co. .... viii Schoen Heater and Stove Co. .... ix R. Wheeler, Son & Co. .... xiii The Simonds Mfg. Co. .... ix
<b>Annunciators.</b> Partrick & Carter ..... vii	<b>Builders' Hardware.</b> C. A. Strelinger & Co. .... vii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co. .... xif E. P. Wilce & Co. .... xi	<b>Furniture.</b> Cutting & De Laney ..... xii
<b>Architects' and Surveyors' Supplies.</b> L. Manasse ..... iv	<b>Builders' Scroll Saw.</b> W. F. & J. Barnes Co. .... ii	<b>Door Hangers.</b> Lane Bros. .... vii	<b>Gas and Water Pipes.</b> Mellert Foundry & Machine Co. .... cover iii Pancoast & Rogers ..... viii Penna. Pipe Mfg. Co. .... cover iv
<b>Architects.</b> C. Powell Karr, C.E. .... iv Smith, F. L. .... xi	<b>Building Paper, Felt, Etc.</b> M. Ehret, Jr., & Co. .... cover iv Warren-Ehret Co. .... cover iii Warren Chemical and Mfg. Co. .... vii H. F. Watson ..... cover iii	<b>Drawing Instruments, Etc.</b> L. Manasse ..... iv	<b>Gas Engines.</b> Economic Gas Engine Co. .... cover ii Williams & Orton Mfg. Co. .... ii
<b>Architectural Wood Turning.</b> Anderson & Dickey ..... iv Standard Wood Turning Co. .... iv	<b>Cabinet Woods and Veneers.</b> J. Rayner ..... ix	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co. .... ii	<b>Gas Fires.</b> H. P. Dixon & Co. .... cover iv
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.) .... cover iii	<b>Cables.</b> Standard Underground Cable Co. .... i	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co. .... v Jas. L. Haven Co. .... cover ii M. B. Swezey ..... ii	<b>Gas Machines.</b> Tirrell Gas Machine Co. .... iii
<b>Artistic Wood Decorations.</b> Buffalo Novelty Wood Turning Co. .... xii Cutting & De Laney ..... xii Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xi	<b>Carbolate of Lime.</b> M. Ehret, Jr., & Co. .... cover iv	<b>Eaves Trough and Gutters.</b> Hatten, Galpin & Co. .... ix	<b>Glass—Plate.</b> Cohansey Glass Mfg. Co. .... cover iii Hires & Co. .... cover ii Malaga Glass & Mfg. Co. .... cover iv Pittsburg Plate Glass Co. .... x P. Semmer Glass Co. .... vii Vanhorne, Griffen & Co. .... i
<b>Artists' Materials.</b> A. H. Abbott & Co. .... cover ii F. W. Devoe & Co. .... i	<b>Carpenters' Tools.</b> Stanley Rule and Level Co. .... cover ii Strelinger, C. A. & Co. .... vii	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co. .... i	<b>Glass—Stained and Mosaic.</b> Beacon Stained Glass Works. .... cover iii Alfred Godwin. .... cover iv Hires & Co. .... cover ii Keystone Stained Glass Works ..... xii C. H. Postel & Co. .... cover iii William Reith ..... cover iii F. J. Riester ..... cover iii Tiffany Glass Co. .... vi
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr., & Co. .... cover iv Warren Chemical and Mfg. Co. .... vii	<b>Carpet Lining.</b> Warren-Ehret Co. .... cover iii H. F. Watson ..... cover iii	<b>Electric Lights.</b> The Thomson-Houston Electric Co. .... cover iii	<b>Greenhouse Boilers.</b> Peter Devine ..... ii Hitchings & Co. .... cover ii New York Central Iron Works. .... cover iii
<b>Asbestos.</b> H. W. Johns Mfg. Co. .... v H. F. Watson ..... cover iii	<b>Cements.</b> H. W. Johns Mfg. Co. .... v M. Ehret, Jr., & Co. .... cover iv	<b>Electrical Supplies.</b> Partrick & Carter ..... vii Shaw & Geary ..... cover iv	<b>Ground &amp; Rough Glass for Floors, Etc.</b> Pittsburg Plate Glass Co. .... x
<b>Automatic Air Valves.</b> Thos. L. McKeen ..... ii	<b>Chandeliers.</b> I. P. Frink ..... ii	<b>Elevators.</b> L. S. Graves & Co. .... v Jas. L. Haven Co. .... cover ii Henry H. Hill ..... ii Howard Iron Works ..... v Morse, Williams & Co. .... ii	<b>Gymnastic Apparatus.</b> Narragansett Machine Co. .... xiv
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co. .... iv Anderson & Dickey ..... iv	<b>Combination Dividers.</b> L. S. Starrett ..... vii	<b>Eliminator.</b> Hine & Robertson ..... vii	<b>Gypsum Paint.</b> John Maxwell ..... iii
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts ..... iii	<b>Contractor and Builder.</b> Allen B. Rorke ..... cover iii	<b>Engineers' Supplies.</b> L. Manasse ..... iv	<b>Hand Sawing Machines.</b> W. F. & J. Barnes Co. .... ii
<b>Bent and Beveled Glass.</b> Vanhorne, Griffen & Co. .... i	<b>Cordage.</b> J. P. Tolman & Co. .... cover ii	<b>Feed Water Heaters.</b> Stewart Heater Co. .... cover ii	
<b>Black Varnish.</b> M. Ehret, Jr., & Co. .... cover iv	<b>Corrugated Iron Lath.</b> The Cincinnati Corrugating Co. .... ii Canton Iron Roofing Co. .... iv N. S. Northrop ..... ii A. Northrop & Co. .... xiii Sykes Iron Roofing Co. .... iv	<b>Fire Brick.</b> Henry Maurer & Son ..... xi	
<b>Boiler Coverings.</b> M. Ehret, Jr., & Co. .... cover iv Shields & Brown ..... iii H. W. Johns Mfg. Co. .... v	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr., & Co. .... cover iv H. W. Johns Mfg. Co. .... v Shields & Brown ..... iii Western Mineral Wool Co. .... v	<b>Fireproof Building Materials.</b> Henry Maurer & Son ..... xi	
<b>Booksellers and Publishers.</b> Houghton, Mifflin & Co. .... vi J. B. Lippincott & Co. .... vi Ticknor & Co. .... vi John Wiley & Sons ..... vi	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot ..... xiv	<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co. .... xi Canton Iron Roofing Co. .... iv	
<b>Brass Goods.</b> C. H. Besly & Co. .... ii	<b>Cutter Heads.</b> Sam'l J. Shimer ..... iv	<b>Fireproofing Material.</b> H. W. Johns Mfg. Co. .... v H. F. Watson ..... cover iii	
<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.) .... cover iii			

PALACE KING  
—AND—  
PALACE QUEEN  
WARM AIR FURNACES.

SEND FOR CATALOGUE.

RUSSEL WHEELER, SON & COMPANY,  
UTICA, N. Y.

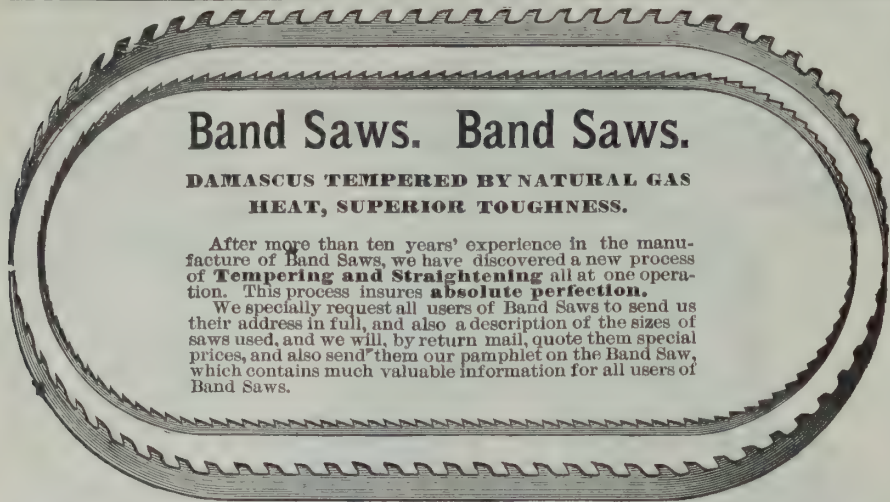


CHILTON PAINTS.

The Chilton Manuf. Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application.

147 Fulton St., New York.  
141 Milk Street, Boston.





The Superior Quality of our Band Saws, All Tempered, Straightened, and Trued at one operation, which we have patented, makes them so perfect that our **SALES HAVE MORE THAN TREBLED IN THE PAST YEAR.** Our largest and best customers prefer them to the best imported saws.

**WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.**

NATURAL GAS

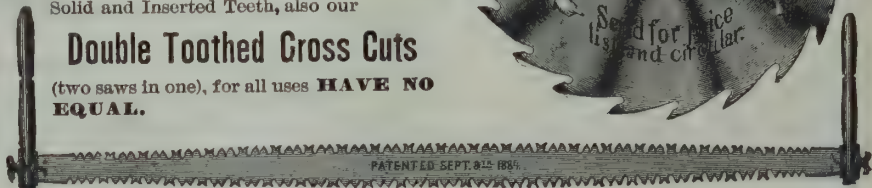
Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

OUR CIRCULAR SAW

Of all sizes from 6 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

Double Toothed Cross Cuts

(two saws in one), for all uses **HAVE NO EQUAL.**



Our SAWYER'S HANDBOOK will be sent **FREE** to any part of the world on receipt of full name and address.

Address **EMERSON, SMITH & CO. (LIMITED),**  
**Beaver Falls, Pa.**

CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

<b>Heating Apparatus.</b> Abram Cox Stove Co.....cover iii Aldine Mfg. Co.....iii Alsop Furnace and Stove Co.....xii Barstow Stove Co.....viii B. C. Bibb Stove Co.....ix Boylnton Furnace Co.....viii Broomell & Sanks.....x Danforth & Clark.....cover iii Duplex Steam Heater Co.....iv Globe Steam Heater Co.....viii Gurney Hot-Water Heater Co.....ii Hitchings & Co.....cover iii E. A. Jackson & Bro.....cover ii Leibrandt & McDowell Stove Co.....viii National Hot Water Heater Co.....viii New York Central Iron Works.....cover iii J. F. Pease Furnace Co.....iv Pierce, Butler & Pierce.....cover iv J. Reynolds & Son.....ix Richardson & Boynton Co.....viii Schoen Heater and Stove Co.....ix Silsby Mfg. Co.....ix The Simonds Mfg. Co.....ix The H. B. Smith Co.....ix B. F. Sturtevant.....viii Weston Engine Co.....cover iv R. Wheeler, Son & Co.....xiii Woodcock & Co.....viii	<b>House Filters.</b> Hyatt Pure Water Co.....xi	<b>Iron and Metal Workers' Tools.</b> C. A. Strelinger & Co.....vii	<b>Iron Work for Building Purposes.</b> Composite Iron Works.....cover ii Mellert Foundry & Machine Co.....cover iii	<b>Japanese Fret Work.</b> Buffalo Novelty Wood Turning Co.....xii	<b>Leveling Instruments.</b> John W. Harmon.....ii C. F. Richardson.....xi	<b>Lithographers.</b> Schumacher & Ettlinger.....cover ii	<b>Mahogany.</b> J. Rayner.....ix	<b>Mantels, Grates, Fire Places, Etc.</b> E. J. Johnson.....vi	<b>Masons' and Builders' Supplies.</b> S. H. French & Co.....iii	<b>Mathematical Instruments.</b> F. W. Devoe & Co.....i	<b>Metal Signs.</b> Joseph Neumann Co. (Ltd.).....cover iii	<b>Metallic Roofing Tiles and Shingles.</b> Cortright Metal Roofing Co.....xi Gummey, Sperring & Co.....cover iv Metallic Hip Shingle Co.....iv National Sheet Metal Roofing Co.....xi Thorn Shingle and Ornament Co.....iii	<b>Mineral Wool.</b> U. S. Mineral Wool Co.....v Western Mineral Wool Co.....v	<b>Moorish Fret Work.</b> C. S. Ransom & Co.....ix	<b>Mortar Colors.</b> S. Bowen's Sons.....v S. H. French & Co.....iii	<b>Office and Bank Fittings.</b> A. H. Andrews & Co.....iii	<b>Oil Well Supplies.</b> Oil Well Supply Co.....iii	<b>Ornamental Brick.</b> Chicago Anderson Pressed Brick Co.....xi Peerless Brick Co.....xi	<b>Ornamental Glass Work.</b> C. H. Postel & Co.....cover iv The Western Sand Blast Co.....iii	<b>Ornamental Rustic Work.</b> John Wheeler.....iv	<b>Paints.</b> The Chilton Mfg. Co.....xiii F. W. Devoe & Co.....i S. H. French & Co.....iii H. W. Johns Mfg. Co.....v Prince Mfg. Co.....cover iii The Standard Paint Co.....cover iv	<b>Paneled Sheet Iron Ceiling.</b> H. S. Northrop.....ii	<b>Parchment Sheathing.</b> Hallett Bros.....xii	<b>Parquet Floors.</b> J. Dunfee & Co.....vii	<b>Patents.</b> Munn & Co.....xi	<b>Pattern Makers' and Carvers' Tools.</b> C. A. Strelinger & Co.....vii	<b>Photographic Outfits.</b> E. & H. T. Anthony & Co.....ii	<b>Planing Mill Machinery.</b> Hoyt & Bro. Mfg. Co.....xii	<b>Polished Plate Glass.</b> Pittsburgh Plate Glass Co.....x P. Semmer Glass Co.....vii Vanhorne, Griffen & Co.....i	<b>Porous Terra Cotta.</b> Henry Maurer & Son.....xi	<b>Porous Earthenware.</b> Henry Maurer & Son.....xi	<b>Portland Cement.</b> Howard Fleming.....vi Lesley & Trinkle.....cover iv	<b>Poultry Yard Appliances.</b> S. S. Bent & Son.....iv	<b>Prepared Roofing.</b> M. Ehret, Jr., & Co.....cover iv H. F. Watson.....cover iii	<b>Pressed Brick.</b> Chicago Anderson Pressed Brick Co.....xi	<b>Pumping Engines.</b> Economic Gas Engine Co.....cover ii	<b>Recording Thermometer.</b> The Draper Mfg. Co.....iv	<b>Reflectors.</b> I. P. Frink.....ii	<b>Roof Snow Guards.</b> John H. Hiller.....cover ii	<b>Roofing Paper, Etc.</b> M. Ehret, Jr., & Co.....cover iv H. W. Johns Mfg. Co.....v The Standard Paint Co.....cover iv Warren-Ehret Co.....cover iii Warren Chemical & Mfg. Co.....vii H. F. Watson.....cover iii	<b>Roofing Slate.</b> E. J. Johnson.....vi The Old Bangor Slate Co.....vi	<b>Roofing Tin.</b> Gummey, Sperring & Co.....cover iv N. & G. Taylor Co.....cover iv	<b>Roofing and Wall Tiles.</b> Canton Iron Roofing Co.....iv Cortright Metal Roofing Co.....xi The National Sheet-Metal Roofing Co.....xi The Standard Paint Co.....cover iv Thorn Shingle and Ornament Co.....iii	<b>Rustless Iron Water Pipe.</b> The Wells Rustless Iron Co.....v	<b>Sand Blast and Embossed Railroad Glass.</b> The Western Sand Blast Co.....iii	<b>Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Sash Lock.</b> Jenkins & Timby.....x The Champion Safety Lock Co.....	<b>Saws.</b> American Saw Co.....cover iii Emerson, Smith & Co.....xiv Seneca Falls Mfg. Co.....ii	<b>Scroll Saws and Tools.</b> W. F. & J. Barnes Co.....ii Seneca Falls Mfg. Co.....ii	<b>Shade Roller.</b> Cushman Bros. & Co.....ii	<b>Shaking Grate.</b> Woodcock & Co.....viii	<b>Sheathing Lath.</b> I. G. Jenkins.....x	<b>Shingle Stains.</b> Sam'l Cabot.....xiv Dexter Bros.....i	<b>Shutter Worker.</b> F. B. Mallory.....iii	<b>Skylights.</b> G. Hayes.....iv	<b>Slate Roofers' Supplies.</b> E. J. Johnson.....vi	<b>Sliding Blinds.</b> Hartman & Durstine.....x Wm. Willer.....x	<b>Stable Fittings and Fixtures.</b> S. S. Bent & Son.....iv	<b>Steam Hot Blast Apparatus.</b> B. F. Sturtevant.....	<b>Steam &amp; Hot Water Heating Engineers.</b> Danforth & Clark.....cover iii	<b>Tools and Machinery for Oil Wells.</b> Oil Well Supply Co.....iii	<b>Tools and Foot Power Machinery.</b> C. E. Little.....h Seneca Falls Mfg. Co.....ii	<b>Tower Ornaments, Finials, Etc.</b> Thos. W. Jones.....vi	<b>Underground Cable.</b> Standard Underground Cable Co.....i	<b>Valves and Fire Hydrants.</b> Mason Regulator Co.....iv Mellert Foundry & Machine Co.....cover iii Pancoast & Rogers.....viii	<b>Varnish.</b> F. W. Devoe & Co.....i Standard Varnish Works.....ix	<b>Ventilating and Exhaust Fans.</b> Geo. P. Clark.....v The Simonds Mfg. Co.....cover iv	<b>Wall Plaster.</b> Adamant Mfg. Co.....vii	<b>Water Heaters.</b> Instantaneous Water Heater Co.....iv	<b>Water Motors.</b> Backus Water Motor Co.....vii	<b>Water Pressure Regulators.</b> H. Mueller & Sons.....iv	<b>Waterproof Parchment.</b> Hallett Bros.....xii	<b>Weather Strips.</b> J. Dunfee & Co.....vii Richmond Weather Strip Co.....iii	<b>Weather Vanes.</b> Thos. W. Jones.....vi	<b>Window Guards and Gates.</b> Composite Iron Works.....cover ii	<b>Window Sash Cord.</b> J. P. Tolman & Co.....cover ii	<b>Wood Carpet.</b> J. Dunfee & Co.....vii	<b>Wood Finishes.</b> Bridgeport Wood Finishing Co.....x F. W. Devoe & Co.....i Murphy & Co.....i D. Rosenberg & Sons.....ix	<b>Wood Floors.</b> Boughton & Terwilliger.....xii	<b>Wood Mantels.</b> Mankey Decorative Co.....xii	<b>Woodworking Machinery.</b> F. H. Clement.....ii J. O. Colladay & Co.....xii Connell & Dengler.....xii The Egan Co.....xii E. & F. Gleason.....cover iv Hoyt & Brother Co.....xii C. B. Rogers & Co.....iv Samuel J. Shimer.....iv	<b>Wrought Iron and Cement Lined Pipe.</b> Penna. Pipe Mfg. Co.....cover iv
---	---	--	--	---	--	--	--------------------------------------	---	---	--	--	---	--	---	---	--	---	--	--	---	--	---	---	--	-------------------------------------	---	--	---	---	---	---	---	--	--	---	--	--	--	---	---	---	---	---	--	---	---	--	---	---	---	---	---	--	---	--------------------------------------	---	--	---	--	---	---	---	--	--	---	--	---	---	---	---	---	--	---	--	--	--	---	--	---	--	--	--

**A VALUABLE BOOK**  
**ON PHYSICAL CULTURE**  
**FREE**  
**ON APPLICATION.**

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

**NARRAGANSETT MACHINE CO.,**  
**55 Sprague Street, Providence, R. I.**

HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH  
**CABOT'S CREOSOTE STAINS.**



These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 30c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. **Send for Samples on Wood, and Circulars.**  
**SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.**



The Thomson-Houston Electric Co.

—MANUFACTURE—

THE ONLY PERFECT AUTOMATIC SYSTEM OF

# ARC AND INCANDESCENT LIGHTING In the World.

*New illustrated pamphlet will be furnished  
on application.*

THE THOMSON-HOUSTON ELECTRIC COMPANY,

Principal Offices: 178 Devonshire St., BOSTON.

Western Offices: Pullman Building, CHICAGO.



## PRINCE'S METALLIC PAINT

An Indestructible Coating for

Iron, Tin and Wood.  
Will cover twice the surface at less than half the cost  
of lead.

But one color made, "Brown." Send for circular, to  
the sole manufacturers,

PRINCE MANUFACTURING CO.,  
71 Maiden Lane, New York.

"Cohansey" & "Bridgeton" BRANDS,  
Superior in Quality, Packed like Foreign.  
Handsome Lustre, Soft Surface, believed equal to  
MOST IMPORTED and superior to other American,  
for Hot Bed and Greenhouses, Builders, Sash  
Manufacturers, Painters, and Florists.  
THE TRADE Generally SUPPLIED.  
COHANSEY GLASS MANUFACTURING CO., N. W. cor. Third & Arch Sts., PHILADELPHIA, PA.

## WINDOW GLASS.



**HARRISON CONVEYOR!**  
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.  
Send for Circulars. BORDEN, SELLECK & CO., Sole Manuf'rs, Chicago, Ill.

# AMERICAN SAW CO.

Trenton, N. J.

MANUFACTURERS OF  
Patent TOOTH and SOLID  
SAWS, GANGS, CROSS  
CUTS, MULAY MILLS,  
&c., &c.

# SAWS

## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

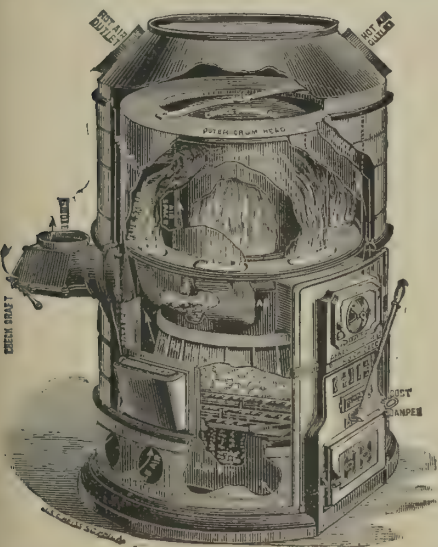
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



SOMETHING NEW!

## Model Novelty Range.

Economy in Space, Fuel, and Labor.

No Brick Jambs or Lintel or Boiler Stand.

Horizontal Hot Water Boiler on  
Top of Range.

HOT AIR ATTACHMENT.

MANY OTHER FEATURES.

Architects, Builders, and Owners should see and  
call for the above Specialties for Dwellings or  
Apartment Houses.

**ABRAM COX STOVE CO.,**  
PHILADELPHIA and CHICAGO,  
EXPERTS AND SPECIALISTS IN HOT AIR AND  
RANGE SUPPLIES.

NEW YORK AGENCY:

WILKINSON & BANTA,  
250 WATER STREET.



# ART STAINED GLASS

For Churches & Dwellings

Antique and Mosaic Work.  
Designs and Estimates on application.

William Reith,

131 N. 7th St., Philadelphia, Pa.



Cast Iron Pipe for Structural Work, Columns, etc.  
Flange Pipe and Specials.  
STOP VALVES, FIRE HYDRANTS, LAMP POSTS.  
MELLERT FOUNDRY & MACHINE CO., Limited,  
READING, PA.

# Art \* Metal Work

BRASS LAMPS FOR CHURCHES.  
BRASS WORK FOR CHURCH ALTARS.  
BRONZE GRILLES FOR DOORS.  
WINDOW RAILINGS.  
ORNAMENTAL LANTERNS.  
BRASS RAILINGS FOR BANKS.  
METAL SIGNS.

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

# STAINED GLASS

MEMORIAL, CHURCH,  
AND  
DOMESTIC WORK.

C. H. POSTEL & CO.,

Branch Office, 527 Arch Street.

1314 RIDGE AVE., PHILADELPHIA.

## STEAM and HOT WATER HEATING ENGINEERS

Correspondence Solicited.

Danforth & Clark, Buffalo, N. Y.



Manufacturer of Ecclesiastic and Domestic

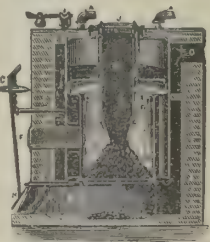
## ART STAINED GLASS,

F. J. RIESTER, Prop'r, Buffalo, N. Y.

The Dunning Patent Wrought Iron Boiler. (Over 13 500 in use.)



THE Dunning Boiler, Self-Feeding, is the best for Low Pres-  
sure Steam Heating, and insures a warm house night and  
day. Free from Carbonic Acid Gas and Smoke. Made in  
eleven sizes, suitable to heat the smallest Cottage to the  
Largest Business Block, in five different styles:  
As a Magazine Boiler, which requires attention but once in  
twenty-four hours.  
As a Surface Burning Boiler, which will burn Hard or Soft  
Coal, Wood, Coke or Gas.  
As a Hot Water Boiler, for Green House and hot water  
heating.  
As a Portable Boiler, to be set without brickwork.  
Also in Two Sections, to pass through any door or window,  
where whole one cannot enter. Steam Engines and Boilers of  
all kinds and machinery generally. Manufactured at the  
New York Central Iron Works, Geneva, N. Y., U.S.A.  
LOCK BOX 40. Send for New Illustrated Catalogue.



# Contractor & Builder.

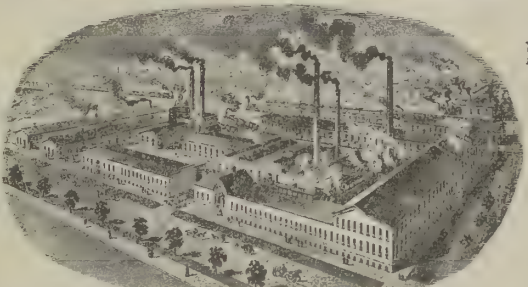
ALLEN B. RORKE,  
423 Walnut St.,  
PHILADELPHIA.

## KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

## BUILDING PAPERS.

ROSIN SIZED and  
WATERPROOF  
SHEATHINGS,  
DEADENING FELTS,  
PLAIN and  
CORRUGATED  
CARPET LININGS,  
ASBESTOS  
SHEATHINGS, Etc.



2 and 3 PLY  
PREPARED ROOFING,  
TARRED ROOFING  
FELTS,  
ROOFING  
MATERIALS,  
Etc., Etc.  
Send for Samples  
and Prices.

ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.

H. F. WATSON, MFR., ERIE, PA.

CHICAGO, ILL.,  
Office, 86 Washington St.

NASHVILLE ROOFING & PAVING CO.,  
Nashville, Tenn.

LIBBY & WILLIAMS PAPER CO.,  
St. Louis, Mo.

# Warren-Ehret Co.,

—MANUFACTURERS OF—

# ROOFING

OF ALL KINDS.

BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc.  
Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

—WORKS:—

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you  
get the quality and brand wanted?

Because every PERFECT SHEET of the  
following three extra fine guaranteed  
brands of Roofing TIN IS STAMPED at  
the works with the name of the brand and  
the thickness. Please note this.

"Old Style." Extra Heavily Coated.  
The Best Made.

"Westminster." Re-dipped. Made  
from Heavy Iron.

COCKLEY Highest Grade of  
K Heavy Regular Coated.

EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and  
full information given.

**N. & G. TAYLOR CO.**

Established 1810. 79th year.

**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



PHILADELPHIA,

423 Walnut Street.

ST. LOUIS,

113 North 8th Street.

CHICAGO,

50 Dearborn Street.

ANYBODY CAN PUT IT ON.  
EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY

**M. EHRET, Jr., & CO.,**

## THE "FLORIDA" HEATERS

TRADE MARK.

FOR STEAM HEATING.

16 Sizes—Magazine Feed for Hard Coal or Coke.  
16 Sizes—Surface Feed for Soft Coal, Wood or Gas.

For Hot Water Heating.

15 Sizes—Magazine or Surface Feed. Adapted to  
any fuel.

IN WARMING

**Suburban Homes**

The "Florida" has an established reputation. Its  
use insures uniform temperatures day and night.  
They are first-class in every respect, reliable, dur-  
able, and give best results in economical use of  
fuel, many thousands being in use. Descriptive  
book and references mailed free.

Address the Sole Manufacturers,

**Pierce, Butler & Pierce Mfg. Co.,  
SYRACUSE, N. Y.**

Estimates free. Satisfactory results guaranteed.



## YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,

SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**P & B**

IDEAL ROOFING,

SHEATHING and INSULATING PAPERS.

Electrical Compound. Tanners', Brewers',

and Preservative Paints.

Please mention this paper



## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.

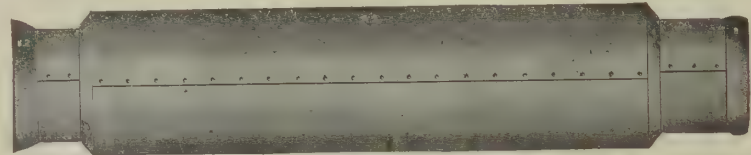
It is designed for

Public Works,

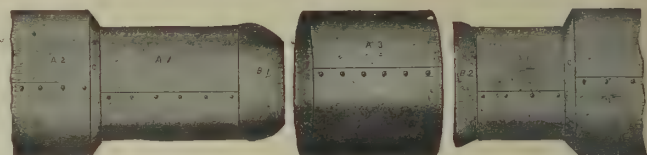
Public Buildings,

—AND—

Private Dwellings.



Pipe complete and ready for the trench.



Wrought iron sleeve and the male and female ends before connecting for jointing.

MANUFACTURED BY THE

**PENNSYLVANIA PIPE MANUFACTURING CO.,**

Germantown Junction, Philadelphia, Pa.

## Architects, Roofers, Builders. "Alderly" & "Pennsyl" Old Method Roofing Plate

THE TWO BEST BRANDS OF GUARANTEED ROOFING PLATES. NO BETTER PLATES MADE.

"ALDERLY," Made of Siemens-Martin Soft Steel. Only Perfectly Square Plate. Perfectly Sorted.

"PENNSYL," OLD METHOD TREBLE COATED ROOFING PLATE. Guaranteed to Stand Any Test. Heaviest Coated.

SEND FOR SAMPLE BOXES OF THESE CELEBRATED ROOFING PLATES.

SOLE MANUFACTURERS of the "PATTEN" METALLIC ROOFING SHINGLES. BEST MADE.

**GUMMEY, SPERING & CO.,**

Philadelphia—Liverpool.

## STAINED GLASS

For Churches and Private Dwellings, etc.

**JEWEL MOSAICS.**

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WOOD

## WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.

## WINDOW GLASS.

Malaga Glass & Mfg. Co.,

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

MALAGA AND MILLVILLE, N. J.

OFFICE,

400 CHESTNUT ST., PHILADELPHIA.



"GIANT" PORTLAND CEMENT,

"EGYPT" PORTLAND CEMENT,

"IMPROVED UNION" CEMENT,

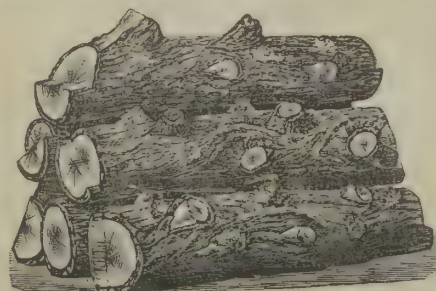
"UNION" CEMENT.

**LESLEY & TRINKLE, Sales Agents, 216 South Third St. Phila.**

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

Manufacturers,

1330 Chestnut St., - Phila., Pa.

## SHAW & GEARY,

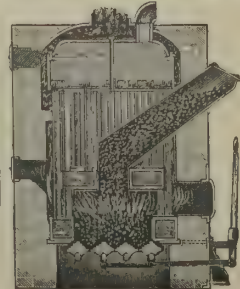
MANUFACTURERS & DEALERS

**ELECTRICAL APPLIANCES.**

53 No. Seventh St.,

PHILADELPHIA.

## The BRONSON Improved MAGAZINE Base-Burning STEAM HEATING BOILER.



For Steam and Hot Water Heating. Auto-  
matic and Reliable. With Brick or Iron  
Settings, as you may prefer. The Bronson  
is constructed on scientific principles, the  
fire surface being of the best boiler tubing  
that can be obtained. This boiler exposes  
more water to the direct action of the fire,  
either in steam or hot water heating, than  
any boiler made. We are making a  
specialty of a High Grade All-steel Boiler,  
which we are anxious to place by the side  
of anything in the world for actual results.  
Reliable Agents Wanted. Send for Illus-  
trated Catalogue and Price List.

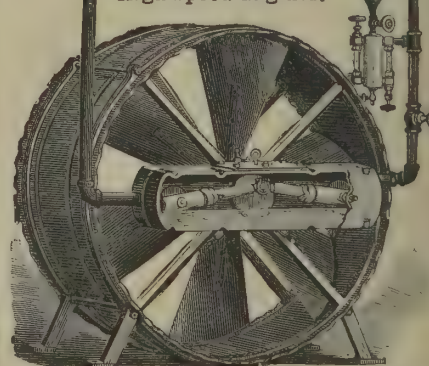
**WESTON ENGINE CO.,**

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sales Agents, 40 Cortlandt Street, New York.



Wing's Disc Fans and  
High Speed Engines.



Gold and Silver Medals taken over all other  
Fans.

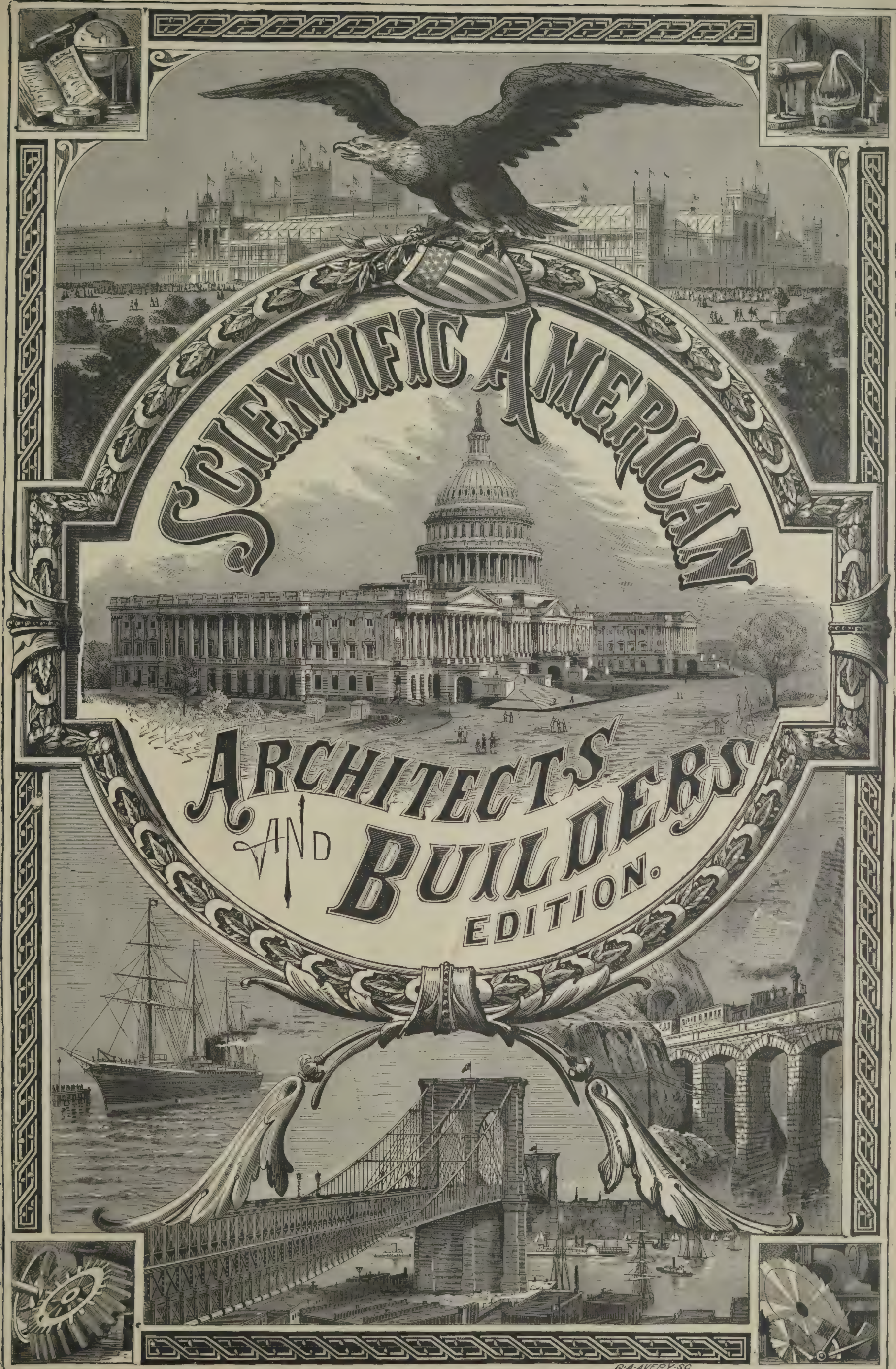
THE FAN BLADES are ADJUSTABLE, and being  
inside of a framework and made of the very  
best material, are perfectly safe. The Fan is noise-  
less, simple and strong, and will move more air for  
the power used than any Fan in the world. The  
Engine is a great success, and the combination a  
valuable adjunct to Mills, Factories, Tanneries,  
Schools, etc., for drying, heating, cooling, ventilat-  
ing, removing of steam, dust, etc.

Fans furnished for Belting, Electric Motors, etc.

The Simonds Mfg. Co., 50 Cliff St., New York.

Send for Illustrated Circulars, Prices, etc.





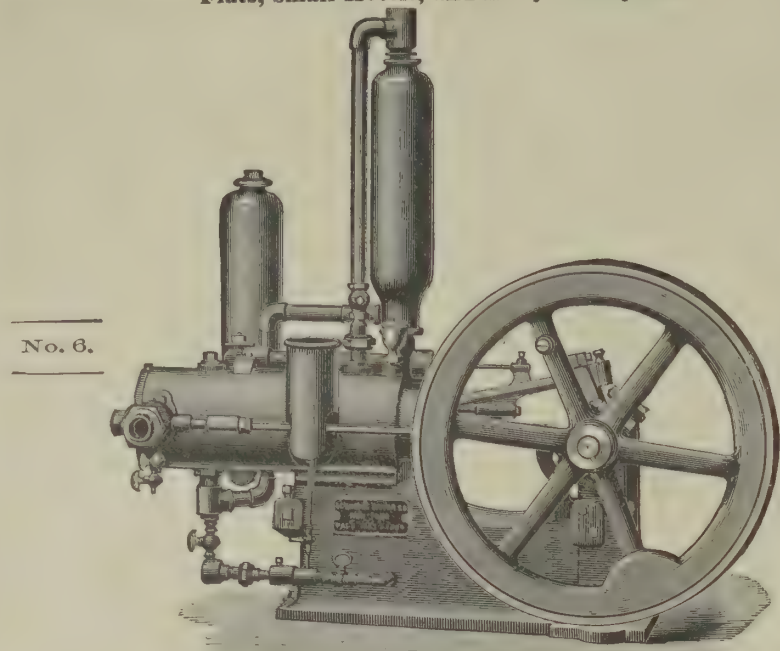


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.

No. 8. One Horse, - 1,500 " " " "

## GASOLINE GAS ENGINES.

No. 15. One Man, - 300 Gallons, 50 feet High, per Hour.

No. 16. One-Half Horse, 600 " " " "

No. 18. One Horse, - 1,500 " " " "

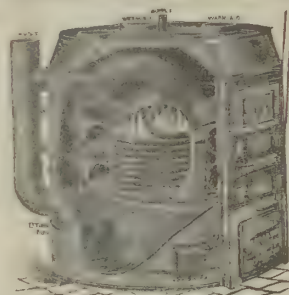
Four Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power.

Our Gas Engines will work satisfactorily when attached to Gasoline Machines.

SEND FOR ILLUSTRATED CATALOGUE.

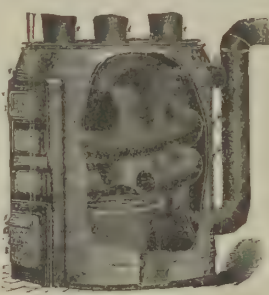
**Economic Gas Engine Co.,**  
Office and Salesroom, 34 DEY ST., NEW YORK.

## The Celebrated HOWARD FURNACES



An entirely original Furnace, with Howard's Patent Spherical Self-Dumping Anti-Clinker Grate. A Powerful and Economical Heater. Is made entirely of the best Cast Iron. Combination Warm Air and Hot Water Heater, with absolutely Gas-Tight joints. DO NOT buy a Furnace until you have SEEN and INVESTIGATED the merits of the Howard.

MANUFACTURED SOLELY BY  
**HOWARD FURNACE COMPANY,**  
Office and Warerooms,  
119 & 121 South Clinton St.,  
SYRACUSE, N. Y.



Are you building a new home? Make it beautiful.

**STAINED and LEADED GLASS.** For Public and Private Buildings.  
Send for Price List.

## BRAY'S PATENT GLASS MOSAIC

Is the handsomest, best and cheapest

STAINED GLASS!

and far superior to ordinary leaded glass for Door Panels, Transoms, Fire Screens, Hall Lanterns, &c., where fine artistic work is desired.

Illustrated Catalogue on application. | Beacon Stained Glass Works, 35 & 37 Province St., Boston, Mass.

Are you erecting a new church? Have it attractive.

## THE OTIS TUBULAR FEED WATER HEATER



With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of

## ELEVATOR PUMPS,

both Passenger and Freight, to heat the Feed Water for the boilers.

We guarantee one square foot of heating surface per horse power.

We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.  
MANUFACTURED BY  
**Stewart Heater COMPANY,**  
40 & 42 Clinton Street,  
BUFFALO, N. Y.

## COMPOSITE IRON WORKS CO.

83 Reade Street, New York.

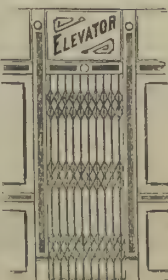
Established 1847.

## Artistic Iron Work

—FOR—

BUILDINGS.

Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



## THE JACKSON Ventilating Grate & Fireplace Furnace

HEATING ON ONE OR TWO FLOORS  
200 DIFFERENT STYLES.

**NINETY**  
of these Grates ordered for the  
New Court House at  
St. Paul, Minn.

**SIXTY**  
in use in Columbia College,  
New York.

Send for Catalogue F.

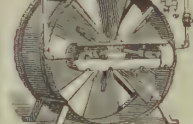


**EDWIN A. JACKSON & BRO., 50 Beekman St., New York.**

**ARCHITECTS, BUILDERS!**  
**ATTENTION IS CALLED TO**  
**ADVERTISEMENT ON PAGE iii**  
FRANK B. MALLORY.

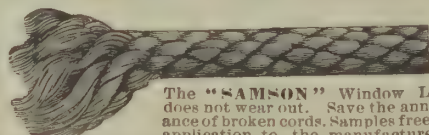
## Wing's Disc Fans and High Speed Engines

Gold and Silver Medals taken over all other Fans. THE FAN BLADES ARE ADJUSTABLE, and being inside of a framework and made of the very best material, are perfectly safe.



The Engine is a great success, and the combination a valuable adjunct to Mills, Factories, Tanneries, Schools, etc., for drying, heating, cooling, ventilating, removing of steam, dust, etc. Fans, Belting, Engines, etc., at lowest rates. The Simonds Mfg. Co., 50 Cliff Street, N. Y. Send for Illustrated Circulars, Prices, etc.

## Solid Braided Cotton Sash Cord.



The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers. Samson Cordage Works, 164 High St., Boston, Mass.

## SCHUMACHER

—AND—

## ETTLINGER,

## Lithographers,

32, 34 and 36 Bleecker

—AND—

311 Mott Streets,

NEW YORK.

## Fine Color Work

A SPECIALTY.

## HIRES & CO., Limited,

MANUFACTURERS and IMPORTERS,

720 and 722 FILBERT ST., Philadelphia.

FRENCH PLATE  
AMERICAN "  
SILVERED "  
ROUGH "  
RIBBED "

**GLASS**

WINDOW ..  
PICTURE ..  
COLORED ..  
CATHEDRAL ..  
ORNAMENTAL ..

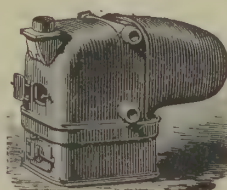
## Dwelling-Warming Hot-Water System.

**HITCHINGS & CO.,**

233 MERCER STREET, N. Y.

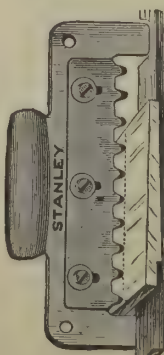
—ALSO—

## Greenhouse Heating and Ventilating Apparatus.



Estimates of cost furnished on application.

SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.



Stanley's Claspboard (Sliding) Marker.  
No. 88. Wood Handle, Steel Blade.....\$0 50

## IMPROVED Labor-Saving CARPENTERS' TOOLS.

**STANLEY**  
RULE & LEVEL CO.  
New Britain, Conn.

SOLD BY ALL Hardware Dealers.

Stanley's Claspboard (Sliding) Gauge.  
No. 89. Wood Handle, Steel Blade.....\$0 50





# SCIENTIFIC AMERICAN

Entered at the Post Office of

AND BUILDERS

New York as Second Class Matter.

Vol. VI. Subscription, \$2.50 a Year.

NEW YORK, NOVEMBER, 1888.

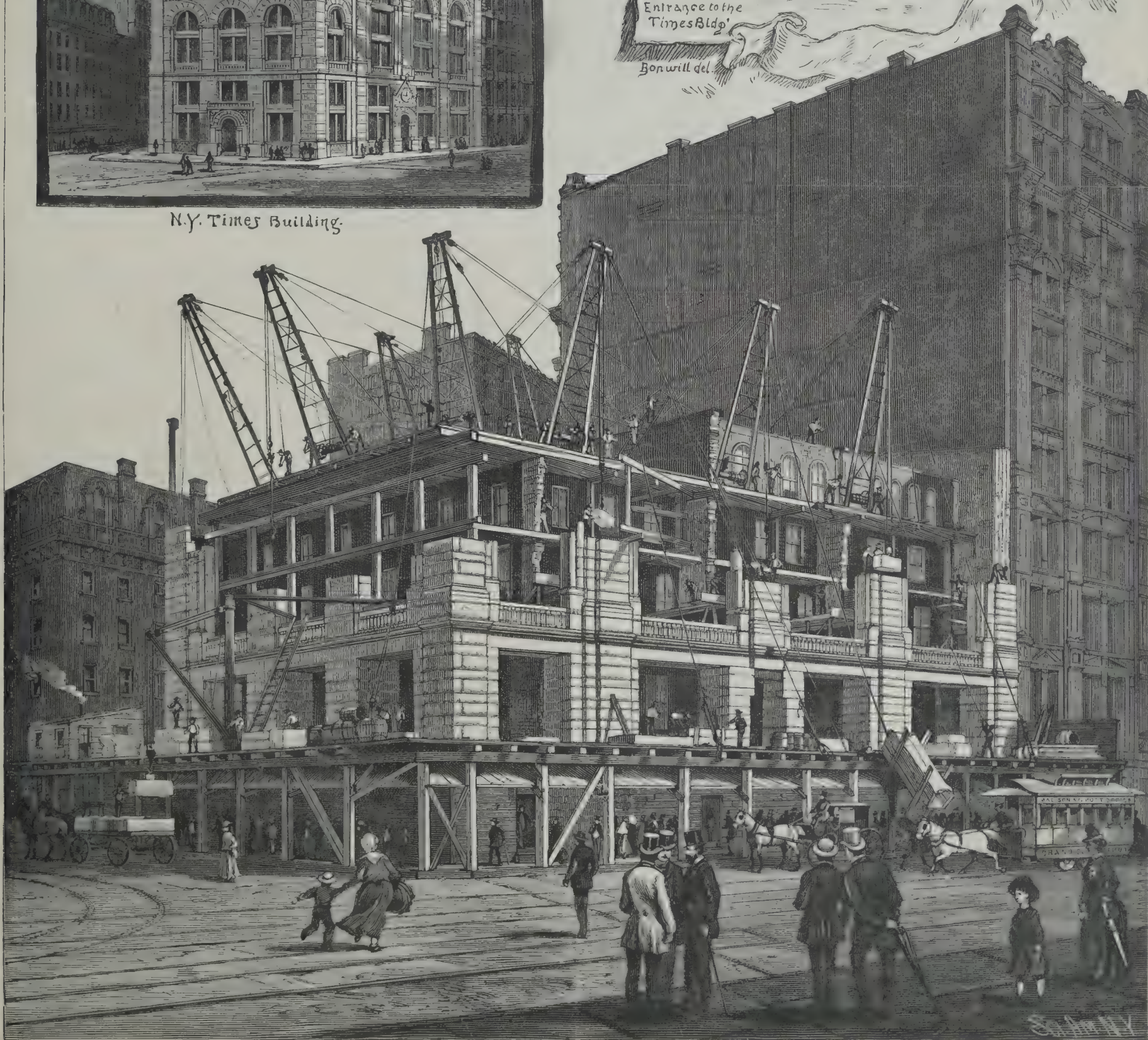
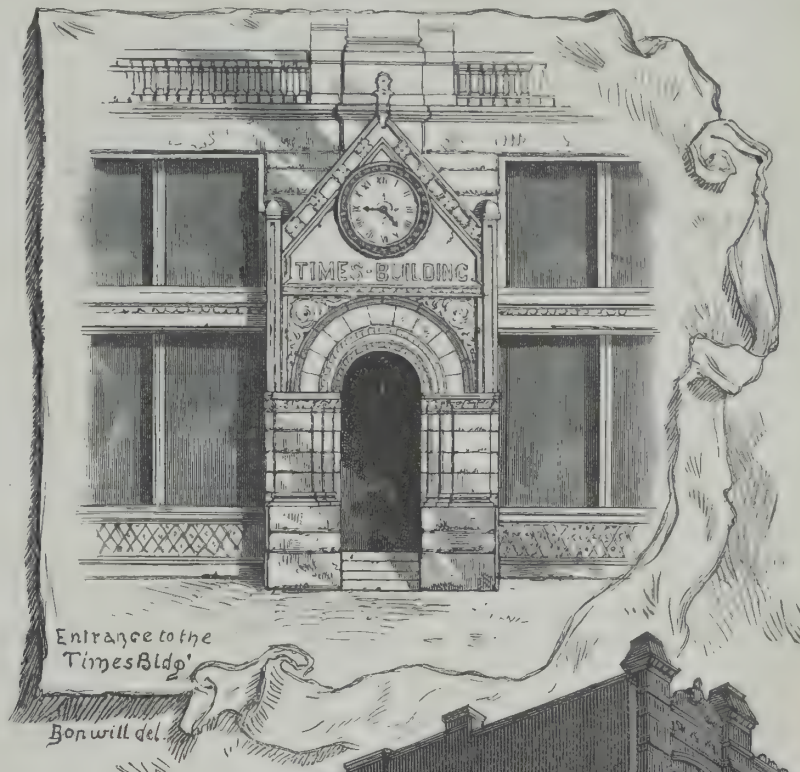
EDITION.

Single Copies, 25 Cents.

No. 5.



N.Y. Times Building.



THE NEW "TIMES" BUILDING NEW YORK—ERECTION OF THE NEW STRUCTURE PRIOR TO REMOVAL OF THE OLD ONE.—[See page 94.]



# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

NEW YORK, NOVEMBER, 1888.

THE

## Scientific American, ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

**Bound Volumes.**—Two volumes are published annually. Volumes 1, 2, 3, and 4, which include all the numbers of this work from commencement to close of 1887, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,  
361 BROADWAY, NEW YORK.

For additional information concerning any of the plans or buildings illustrated in these pages, address MUNN & Co., as above.

### CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN &amp; Co., Publishers, 361 Broadway, New York.

### CONTENTS

Of the November number of the ARCHITECTS AND BUILDERS EDITION of SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

Acoustics, defective	101	House, meeting, old, at Lambeth	91
Atrium in Roman houses	86	House or office, small	94
Barn and carriage house for \$800	100	House, Queen Anne, at Richmond Hill	88
Blind, inside sliding window, the Hartman	101	Ivy on buildings	96
Bracket, roofing, Stanley's patent	101	Lock, theater	101
Building, "Times," new	85	Machine, woodworking, new	102
Buildings, municipal, Glasgow	96	Machines, electric light, a nuisance	101
Cement, Portland, experiments	97	Notes and Queries	91
Church at Richmond Hill, L. I.	99	Pavement, Roman tessellated, at Box, England	98
Construction, slow burning	98	Pavilion of Chili at Paris exposition of 1889	93
Cottage, Queen Anne, at Richmond Hill, N. Y.	92	Pine, white, substitutes for	95
Cottages, two, of moderate cost	86	Plan of a Paris square	101
Details for two cottages of moderate cost	89	Planer and matcher, new double cylinder	102
Exhibition, Glasgow, view from under the central dome	97	Pulpit, John Bunyan's	94
Exhibition, international, at Glasgow	96	Residence at Orange, N. J.	90
Flooring, stall, patent, improved, Logan's	102	Residence at Worcester, Mass.	96
Flower, passion, hardy blue	96	Residences, two, at Springfield, Mass.	96
Furnace, portable warm air, the M. H. Jacobs	102	Shavings as a filling	86
Furnace, warm air, portable, spiral radiator, M. H. Jacobs	102	Sykes Iron Roofing Co. pamphlet	102
Granite, polishing	95	Speed, practical limit of	98
Hedges of flowering plants	100	Squares of Paris	101
Hotel, at Richmond, Va., design for	96	Stables, cow, ventilation of	94
		Stalls, self-draining floor for	102
		Streets, Idaho, that vanish	93
		Villa at New Rochelle	87, 91
		Windows, decoration of	86
		Wood, petrified, in Texas	97

### TWO RESIDENCES AT SPRINGFIELD, MASS.

One of our colored plates this month is devoted to the representation of some of the beautiful private residences of Springfield, Mass. One of the illustrations shows the home of Andrew L. Fennessy, Esq., a substantial, compact, and attractive structure, with several features of architectural interest. The other picture gives an idea of the elegant dwelling of Julius H. Appleton, Esq. It presents graceful outlines and a stately appearance. Our illustrations were prepared from photographs of the buildings taken by M. P. Warner, of Holyoke, Mass., who is well known as an architectural photographer of rare skill and experience.

### TWO COTTAGES OF MODERATE COST.

One of our colored plates this month shows a pair of cottages of moderate cost.

Referring to the house on the left, the front measures 20', side 24', not including piazza. For size of rooms see floor plans. Height of cellar is 6' 8"; first story, 8'; second story, 8'. Foundation of 8" brick. Moulded novelty siding, except second story front. Second story front of 18" pine shingles; roof shingled. Cost \$1,200 to \$1,300.

Among the special features is a large entrance hall, and cellar under the whole house. Ample closet room throughout. Bed room on first floor, but this can be used for other purpose if necessary.

Referring to the house on the right, the front measures 24', side 26', not including piazza or front projection. For size of rooms, see floor plans. Height of cellar, 6' 8"; first story, 8' 6"; second story, 8'. Foundation, 8" brick. First and second stories moulded novelty boards, gables and roof shingled. Cost, \$1,400 to \$1,500. Among the special features are cellar under the whole house, fair sized hall, large pantry, sewing room, and ample closet room.

On page 89 we give sundry details relating to various parts of these dwellings. Their low cost and excellent arrangement make them desirable for construction wherever dwellings of this grade are needed.

### Decoration of Windows.

The *Progres Photographie* has an article on the decoration of window panes, or rather of window screens, with gelatin chloride of silver transparencies. Suitable positive transparencies are selected, and arranged upon a sheet of paper. A sheet of thinnish glass the size of the window pane is procured, and the transparencies, as arranged in their places, affixed to it by either copal varnish or Canada balsam. Strips of colored glass are then cut the proper size to fill in the spaces between the pictures, or, so to speak, frame them. These strips are similarly fixed to the sheet of glass, and the whole left for four-and-twenty hours in order to allow the varnish or balsam to dry. When dry all the corners and edges should have a strip of tinfoil cemented to them to finish them off. The screen is then ready. To decorate the window, cement the transparencies directly on to the glass of the window pane, and treat the colored glass strips as before. Sometimes, instead of strips of colored glass, designs in matt glass are used to inclose the pictures. The required pattern is cut out of stiff paper. That is, the design to be left clear is cut out in stiff paper, and this paper stencil is pasted on to the sheet of glass to be ornamented. When dry it is fixed flat at the bottom of a box, some 25 centimeters high, with the paper side up, then some 500 or 600 grammes emery powder and the same quantity of small shot are placed on it, and shaken vigorously backward and forward until the constant rubbing of the emery and shot has roughened the exposed surface of the glass. When sufficiently roughened, take it out and wash off the stencil. The finer the shot and emery powder, the finer the grain of the ground glass part. If flashed glass be used instead of plain, a colored design upon a matt white ground will be obtained.

### The Atrium in Roman Houses.

This for a long period was the most important apartment in a Roman house. It was generally more spacious than any other, and existed in some shape in every mansion, great or small, from the earliest down to the latest times. It was always placed opposite to the principal entrance, and was in the great majority of cases lighted by an aperture in the center of the ceiling, open to the sky, which was called *impluvium*, because the surrounding roof sloped toward it so as to conduct the rain down into a reservoir called *compluvium*, formed in the pavement below for its reception. The atrium was originally the public room, open to all members of the family, to friends, and to visitors. In the middle was placed the fireplace of the house (*focus*), where all culinary operations were conducted, the smoke escaping through the *impluvium* above; beside the focus a small altar was erected, upon which were placed the offerings to the domestic gods, the Lares and Penates, who occupied niches hard by; and the focus being the spot farthest removed from the exterior of the mansion, the space which it occupied was sometimes termed *penetralia* or *foci penetrales*. In the

atrium stood the marriage couch (*lectus genialis*), immediately opposite to the door, and hence it was sometimes distinguished as *lectus adversus*. Here, too, all the members of the household shared the common repast; here stood the looms; here the mistress plied her labors surrounded by her maidens; here the master received his visitors; here, when a death occurred, the corpse was laid out previous to the funeral, with feet toward the outer door; and here were arranged the waxen images of illustrious ancestors, in which Nobles took such pride. This description must be understood to apply, in so far as persons belonging to the higher ranks were concerned, to the primitive ages only, when the atrium was the sole public apartment. In process of time separate rooms for cooking, for banqueting, and for carrying on ordinary domestic toils were constructed, a private chapel was provided for the gods, and in the houses of the great the atrium was set apart for the reception of clients and of those who sought assistance from or desired to testify their respect for the lord of the mansion — *W. Ramsay*.

### Interesting Experiments with Portland Cement.

A recent number of the *Annales des Ponts et Chaussées* contains an interesting article on the permeability of Portland cement mortars, by Messrs. L. Durande-Claye and P. Bebray. In conducting a series of experiments on samples of cement mortar taken from various marine works in England, France, and Belgium, the authors observed that all these mortars were permeable. A block of the material placed in an earthenware dish in such a way as to divide the dish into two compartments was rapidly penetrated by a 6 per cent. solution of magnesium sulphate poured into one of the compartments, leakage past the sides of the block being prevented by a water-tight joint of plaster. As the solution filtered through it was constantly removed by a siphon, and fresh solution poured in to the first compartment. At the end of sixteen days a fissure 3 or 4 centimeters long appeared in the block, and on the next day another crack was seen, the block swelling in the process. It was then determined to carry out a number of experiments with ordinary water, a solution of chloride of magnesium, and one of sulphate of magnesium. The arrangement finally adopted was to close one end of a glass tube about 1½ in. in diameter with plugs of the cement mortar, the other ends of the tubes being closed with caoutchouc stoppers, through which passed glass tubes about 40 in. in length connected with Mariotte flasks containing the different solutions. The cement mortar used consisted in each instance of one part by weight of cement to four parts of sand, mixed with quantities of water varying in different cases from 0.07 up to 0.12 of the total weight of the mixture, and in all the experiments the rate of filtration was at first somewhat rapid, but diminished as time went on, becoming finally extremely slow. The glass tubes invariably cracked after some days, owing to the swelling of the cement plug, thus putting an end to the experiments. Three series of experiments were made; in the first the mortar prepared with 9 per cent. of water was the least permeable, that mixed with 7 per cent. was extremely so, as was that prepared with 11 per cent. In the second series the best results were obtained with 11 per cent. of water, and in the third series with 10 per cent. The action of the chloride of magnesium, which was a 6 per cent. solution, was much less injurious than the solution of magnesium sulphate, which was of the same strength. Chemical analysis showed that the cements, after being acted on by the latter reagent, contained from 0.75 to 0.80 per cent. of sulphuric acid, showing that in the double decomposition taking place between the calcium and magnesium salts, a portion of the calcium sulphate remained in the body of the mortar, and it is to this fact that the authors are disposed to attribute the dislocation of Portland cement masonry when exposed to the action of sea water; for while the magnesia produced is deposited in the state of a thin cream without consistence, the sulphate of chalk solidifies more or less completely in the crystalline form and develops considerable internal stresses.

### Shavings as a Filling.

To the Editor of the Scientific American:

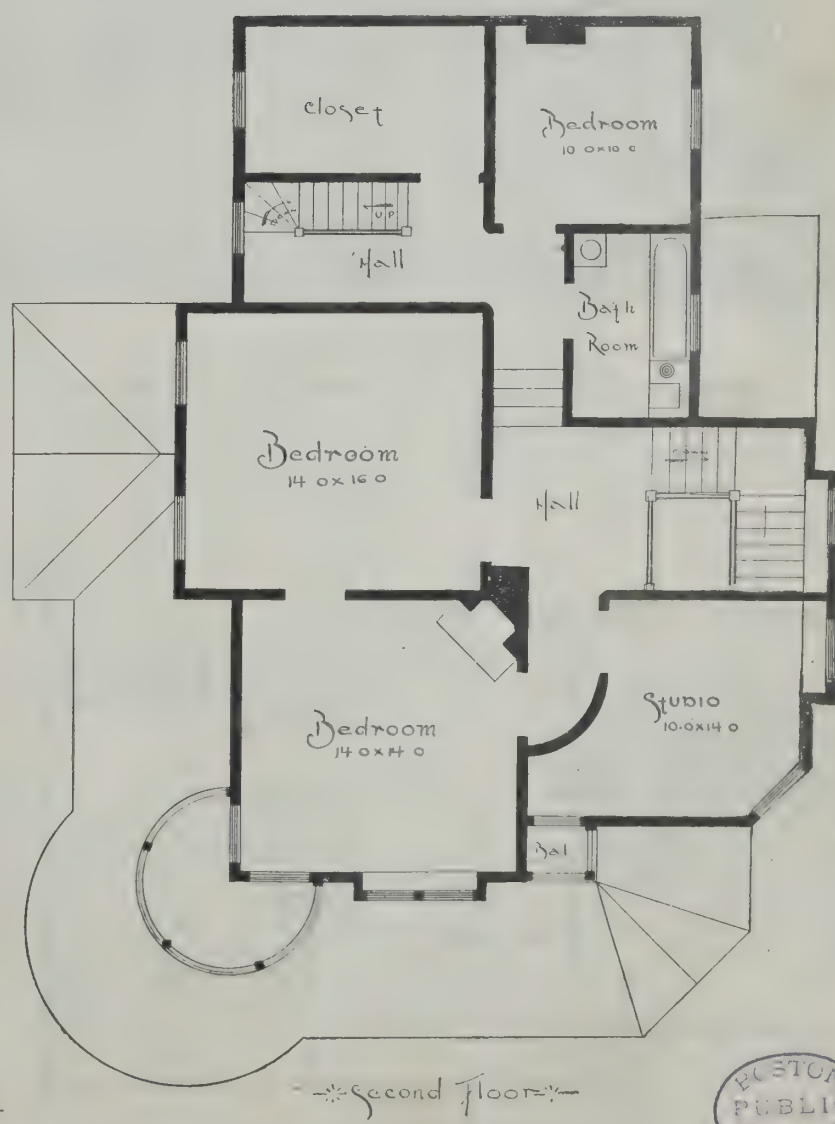
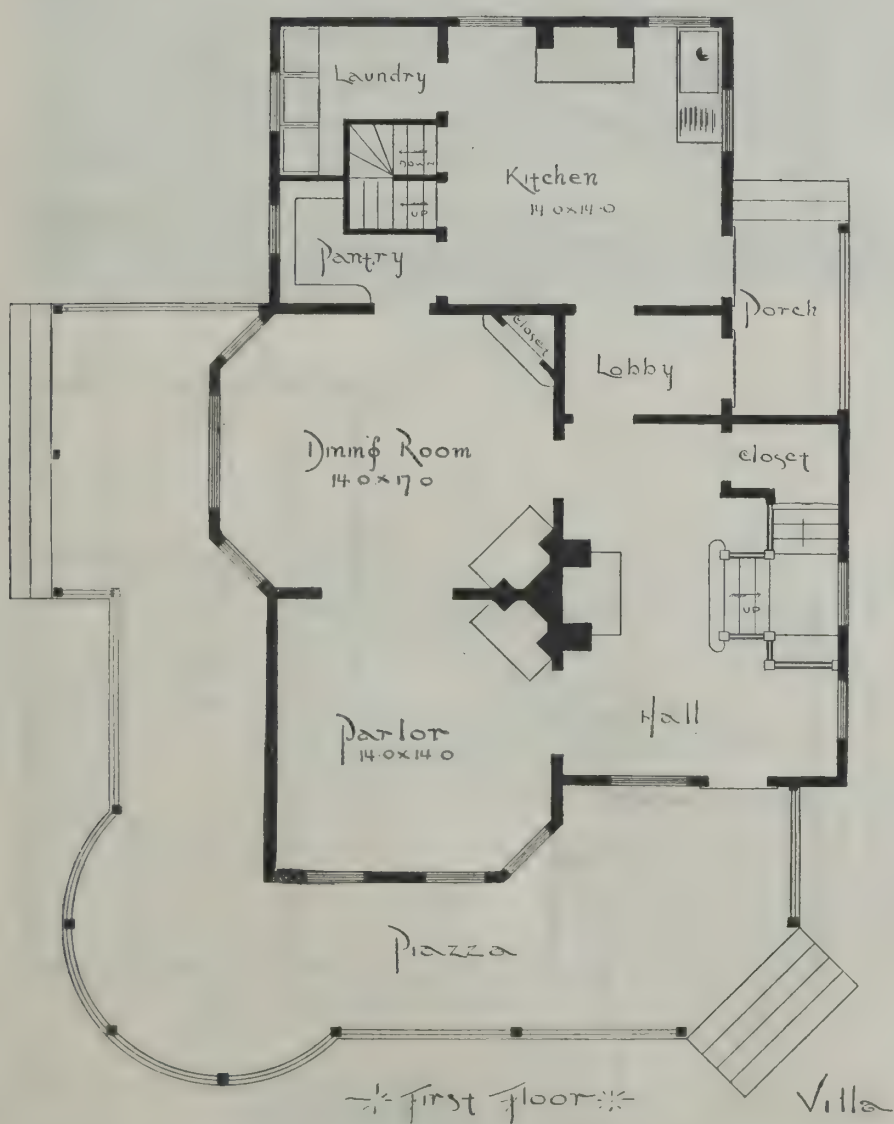
I think the average house could be made much warmer in winter and cooler in summer by spreading light planing mill shavings an inch deep on the top of the ceiling next to the laths. But shavings would be very inflammable and spread fire quickly. Sawdust would be rather heavy for the laths and beams to support, and almost as dangerous in case of fire. Do you know any way in which planing machine shavings could be made non-inflammable, or could you suggest anything better? Mineral wool would be just the thing, but it is too expensive; though it would be worth its cost by delaying the downward spread of flames in case of fire above the ceiling.

M. G.

Pueblo, Colo., Oct. 6, 1888.

[ANS.—We know of nothing better than mineral wool as a filling; considering its fireproof and anti-insect and anti rat qualities and other merits, it is the cheapest material.]





A VILLA AT NEW ROCHELLE.

[For description see page 91.]





## A QUEEN ANNE HOUSE AT RICHMOND HILL.

This cottage is built on a terrace, and there is a summer kitchen, and a study in the basement, well lighted.

The kitchen and pantry are wainscoted to the height of three feet with narrow beaded white pine, with neat moulded cap as finish.

A furnace is provided in cellar, which is cemented and contains coal and wood rooms.

The first story is covered with clapboarding and the second is covered with shingles, also the roof.

On the first floor there is a large hall, parlor, dining room, and kitchen, which latter is used as a dining room in summer.

Between the dining room and kitchen is a lobby, which contains a dumbwaiter to kitchen.

The dining room has a conservatory in front; also fireplace, with a slate hearth and a pretty mantel.

The parlor has an attractive bay window, a fireplace with tile hearth, and an artistic mantel.

The parlor is finished in cherry, the rest of the wood-work throughout is of North Carolina pine.

The door and window casings are beaded and corner blocks are provided.

The hall is large, fitted with fireplace, and is used as a library.

A very tasteful staircase leads to second floor, with

newels, posts, balusters, and rail neatly turned. A window on staircase gives plenty of light.

The bed rooms are ample and fitted with fireplaces, mantels, closets, and everything complete.

The bath room is neatly wainscoted, and contains bath tub, wash bowl, and water closet; supplied with hot and cold water.

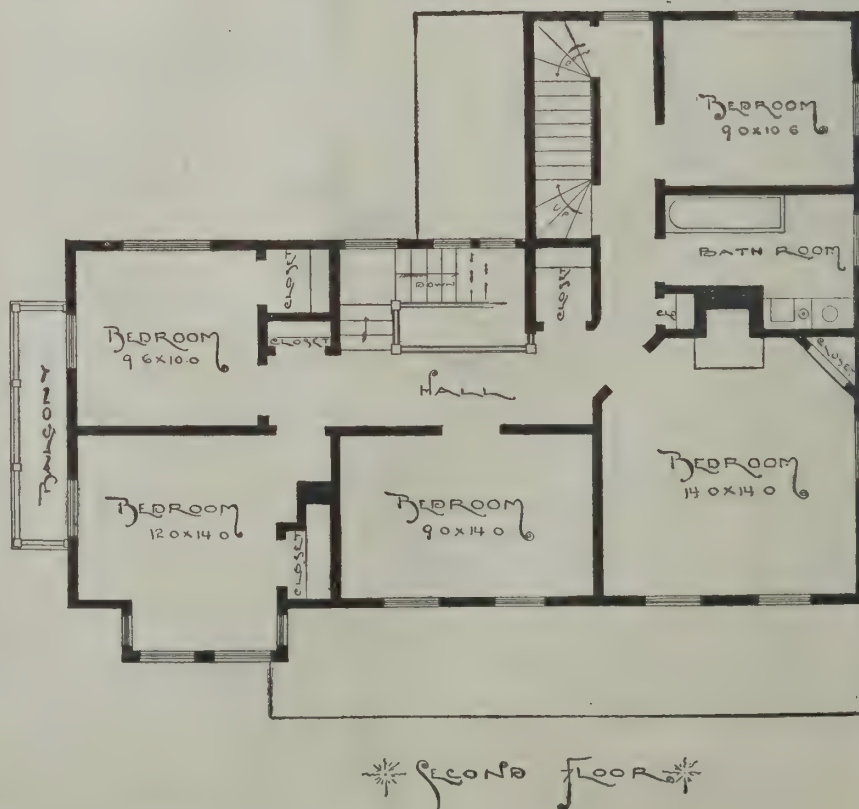
There are servants' rooms besides trunk room in attic.

This cottage is painted a light yellow, and the roof

Indian red.

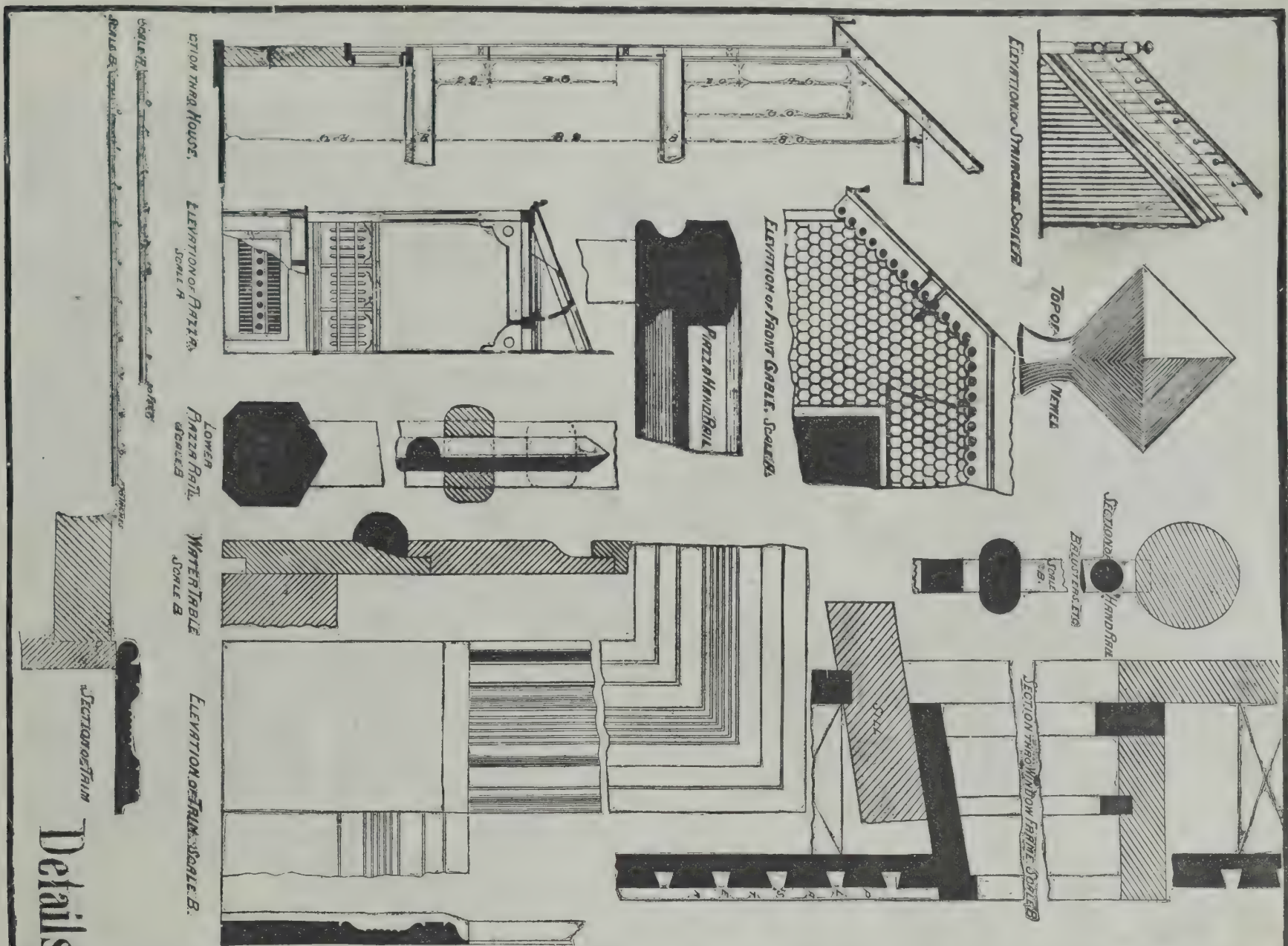
The cost of this house was \$5,000, complete.

Our engraving was prepared direct from a photograph of the building.

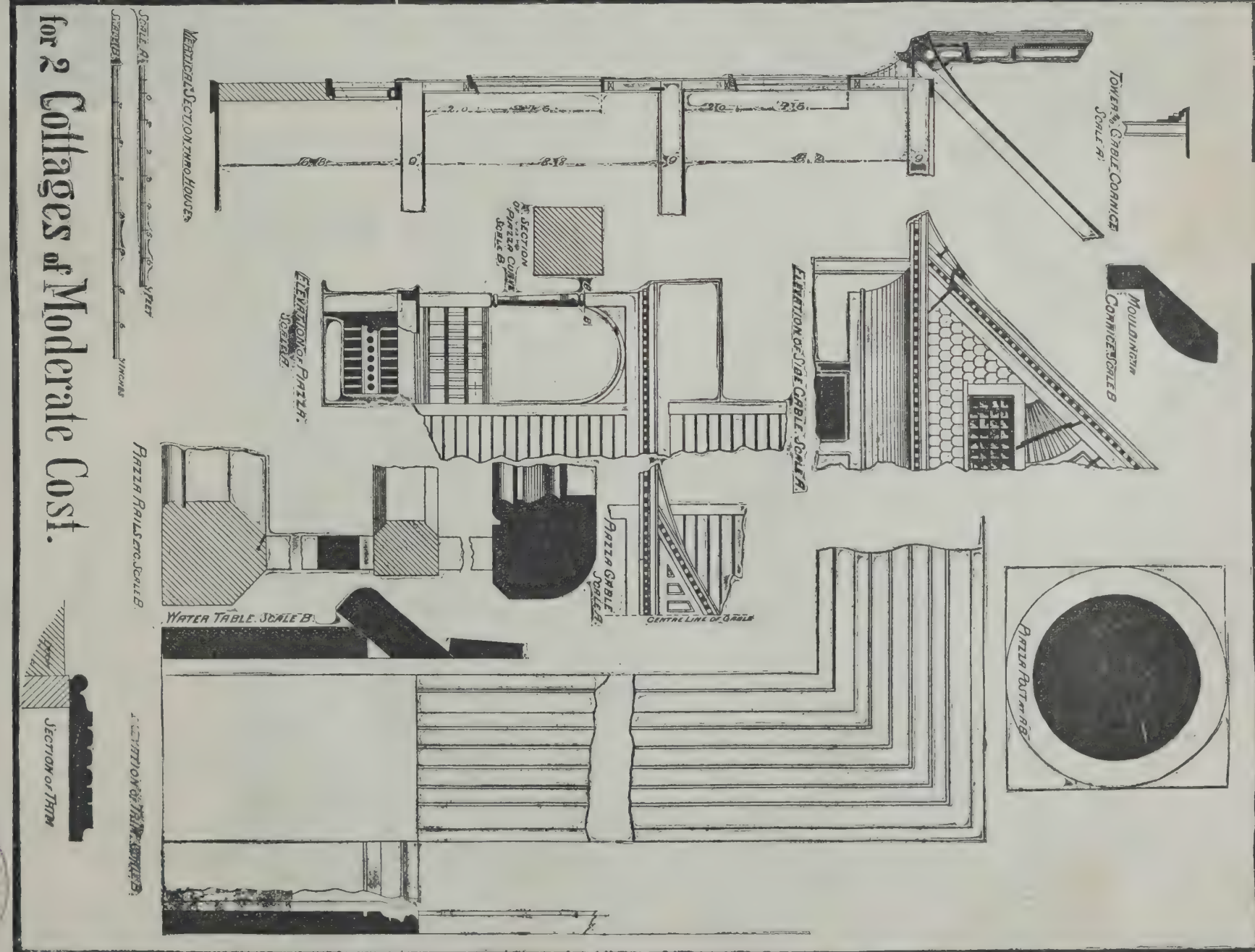


A QUEEN ANNE HOUSE AT RICHMOND HILL.





# Details



# for 2 Cottages of Moderate Cost.



A RESIDENCE AT ORANGE, N. J.

There is a cemented cellar under whole house, with furnace room, coal and wood cellars.

On first floor there is a drawing room that has a pretty nook at corner, open fireplace, with tile hearth and a handsome wood mantel in the French style.

This room is finished in white and gold; the library is finished in cherry, has a fireplace, with the hearth laid in tiles and an artistic cherry mantel. The main hall and hall of second floor are finished in oak, and are provided with open fireplace and mantel to correspond. There is a handsome staircase in oak, with newels

carved and turned, with posts, balusters, and rails to correspond. The dining room is also in oak, and contains a unique corner fireplace, with tile hearth and mantel, and at either end of room, at opposite corners, there are artistic little china closets fitted up with doors glazed with beveled plate glass. The vestibule is neatly



Second floor



First floor

A RESIDENCE AT ORANGE, N. J.





paneled four feet from floor, as wainscot. The kitchen is complete in all its appointments, and is wainscoted with narrow beaded stuff. Butler's pantry and laundry are wainscoted similar. The butler's pantry is neatly fitted up with drawers and shelves complete. Also a butler's closet, supplied with hot and cold water. The kitchen has fireplace fitted with range. The laundry has wash trays that are fitted up in the best possible manner and supplied with hot and cold water. Stairs lead from butler's pantry to cellar, second floor, and attic.

The bed rooms are large and cheerful and amply provided with closets. The bath room is wainscoted and provided with all modern improvements. Four bed rooms in attic.

The house is piped for gas, the ceilings are neatly corniced, and artistic flower pieces are provided.

This home cost \$13,324 complete. Built by Mr. Wood. Our engraving was prepared direct from a photograph specially taken for the SCIENTIFIC AMERICAN.

#### A VILLA AT NEW ROCHELLE.

The residence is located on Sound View Hill, overlooking the Long Island Sound, New Rochelle, New York. It was recently built for the late John Thurston, Esq., at a cost of \$8,860.

The house is admirably planned, and presents a picturesque appearance.

The principal rooms on first and second floors have an outlook on the waters of Long Island Sound. The dining room has an octagonal projection, producing a very pretty effect, both upon the interior and exterior.

This projection is carried up two stories, but on the second floor it is made square.

Passing up the front steps on to the piazza, which runs across front and side of building, you enter the house by a large door which opens into the grand hall, which is finished in oak highly polished, with sides of wall paneled with oak.

The staircase is very fine, with massive carved newels, with candelabra on top of each of solid brass. Four steps up is a landing with a pretty stained glass window and seat. The posts, rails, and balusters are of oak, neatly turned.

From this landing five more steps rise to another landing, then seven steps to the second floor.

Opposite this staircase is a grand old fireplace, with tile hearth and a massive oak mantel, prettily carved and highly polished, with plate glass mirror.

The ceiling is paneled in squares and angles in an artistic manner, in oak.

On the left of entrance hall you enter parlor through an archway with portieres, and find a large room finished in mahogany, with a massive mantel and mirror running to ceiling.

Passing through another archway, you enter the spacious dining room, with mantel in cherry, and a buffet is built in, with a very handsome art glass window.

In the opposite corner from fireplace is a china cabinet of cherry.

The kitchen pantries and laundry are as perfect in their arrangements and details as could be desired.

On the second floor all the rooms are light and cheerful, finished in a high polish.

The studio is finished in dark red.

The bath room is finished in whitewood, and is most complete in every respect.

In the attic there are a number of rooms, store rooms, etc.

There is a cellar under whole of house, which is cemented, and contains coal, wood, and furnace rooms, the latter provided with a steam heater.

The ceilings are all neatly corniced, with flower pieces in center.

The cost of this house was \$8,860, complete.

Our engraving was prepared direct from a photograph of the house specially taken for the SCIENTIFIC AMERICAN.

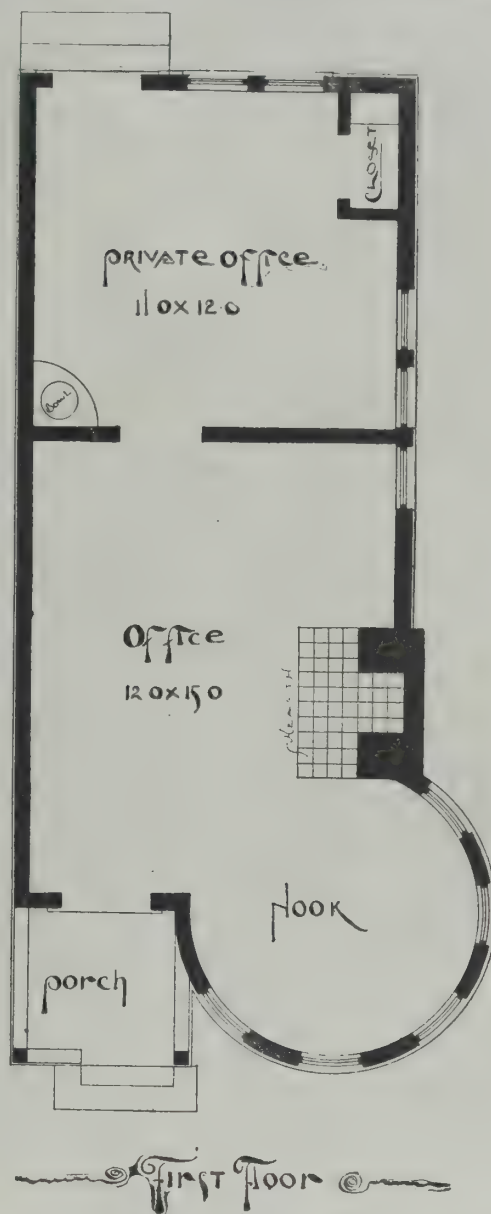
IN the Michigan woods there is coming into use a machine that slices shingle length bolts off every stump within a radius of 100 feet.

#### A SMALL HOUSE OR OFFICE.

Mr. Sleight, of Roseville, New Jersey, has recently built this attractive office building, of which our engraving is from a photograph.

The circular bay at corner rises into a tower, and the chimney at side, of old bricks, forms a peculiar feature.

There is a stone foundation or footing laid up to take frame of building, which is first covered with matched sheathing and then white pine shingles laid as shown, in the old fashioned way; the shingles being painted a



buff color, with trimmings of white, making a very pretty contrast. The roof is shingled and painted red.

The first story contains an office 12 x 15, besides the circular bay that is large enough to be used for a reception room, and a private office 11 x 12; the former being provided with an open fireplace and a brick mantel, with chimney breast running to ceiling, all of which are of terra cotta brick neatly paneled, with a pretty design in center of breast.

The floors are of ash, laid in narrow widths, while the walls and ceiling are plastered; the walls being wainscoted to a height of four feet with narrow beaded whitewood, finished with a neat moulded cap.

The trim throughout is of whitewood stained cherry; the door and window casings being neatly beaded with turned sunk corner blocks at angles.

The second floor is not finished off, but two large rooms could be easily fitted up at a small expense.

The cost of this building was \$1,000.

#### A QUEEN ANNE COTTAGE AT RICHMOND HILL, N. Y.

This house is situated on one of the most attractive and highest points of Richmond Hill, Long Island, surrounded by trees and pretty flower gardens.

Among the features of the exterior is a broad piazza across the entire front, with returns at each end.

The first story is covered with clapboards, the second story shingled.

The clapboards and all the woodwork of the first story are painted a dark shade of olive green, shingles of second story not painted.

The roof has a variety of gables, eye windows, and dormer windows, etc., covered with shingles and painted Indian red.

The foundation is of stone laid in lime and cement mortar, with an underpinning of cut bluestone neatly pointed up.

There is a cemented cellar under whole of house, with coal and wood cellar, furnace room, etc.

The front entrance is provided with a divided or Dutch door.

On the first floor is a large hall, well adapted as a general sitting room.

The staircase, of handsome design, starts at the left of entrance, and has pleasant windows.

The newels, posts, balusters and rail are neatly turned out of cherry.

The trim in the principal rooms is of cherry.

The door and window casings are neatly beaded and band moulded.

The parlor and dining room have fireplaces, with tile hearths and artistic mirrors, etc.

The dining room is fitted up. The kitchen

The library has a pretty tiled open fireplace, with a neat hardwood mantel, and a large bay window thrown out at side, and one large window, five feet wide, overlooking the country, bay, and ocean.

The bedrooms are cheerful, and provided with ample closet rooms.

The bath room is wainscoted and neatly furnished with tub, bowl, and water closet.

In the attic are two bedrooms, 10 x 14, and a servants' room, besides a store-room, unceiled, under the cedar shingles, making it like a cedar closet.

The house, as built by Mr. Vaughan, cost about \$7,500, but could be built for considerably less in some localities.

FULL plans, specifications, and details ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.



A SMALL HOUSE OR OFFICE.





\*First Floor\*



\*Second Floor\*

A QUEEN ANNE COTTAGE AT RICHMOND HILL, N. Y.

[For description see page 91.]





# PAVILION OF THE REPUBLIC OF CHILI AT THE PARIS EXPOSITION OF 1889.

Since the opening of the preparatory period of the Universal Exposition of 1889, a large number of foreign countries, desirous of participating in it brilliantly by the erection of structures worthy of the part that they are to play, have decided to put their projects out to competition in order to utilize the capacity of the most renowned specialists, and, by skillful selection, reach as perfect results as possible. Among the most remarkable competitions may be mentioned the one opened by Chili for the erection of its pavilion. There were three French firms of builders who obtained the rewards offered by that republic, and, of these, Messrs. Moisant, Laurent, Savery & Co. obtained the first prize and were awarded the work.

The location accorded to the Chilean government consists of a quadrilateral of 65 by 80 feet, situated at the angle of the small park of the Champ de Mars to the right of the Eiffel tower with respect to a visitor standing upon the bank of the Seine and turning his back to the Trocadero.

The conditions of the competition were particularly severe, and, in order to show how they were carried out by the successful architects, we present herewith, from *Le Genie Civil*, a view of the front of the adopted plan.

The building consists of a central structure surmounted by a dome and flanked by four rectangular towers, surmounted by small domes which are surrounded by decorative capitals placed upon the uprights of the towers, which themselves consist of metallic caissons whose faces are provided with terra cotta panels.

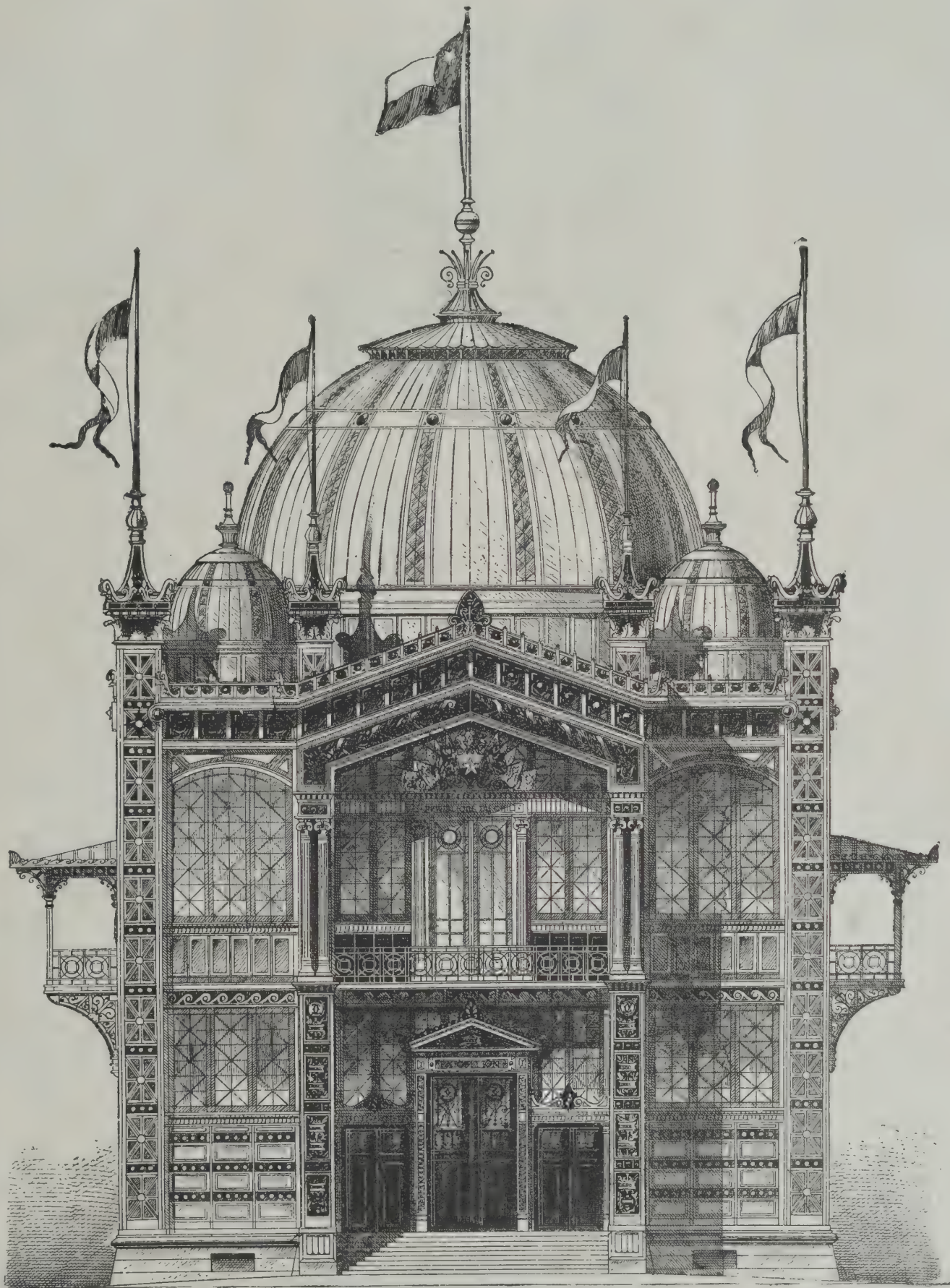
The entrance, which is formed of a projecting portico extending to the top of the building, gives the latter the truly monumental character required by the specifications. A flight of steps of the whole width of the portico leads to the peristyle upon which open the bays, giving direct access to the interior of the edifice. These bays are three in number, one large central one and two small ones all having folding doors to prevent entrance and exit from being impeded. The side opposite the entrance has a projection representing a large winter garden, intersected midway by a balcony communicating with the gallery of the first story. Balconies, in fact, exist on every side, for the portico likewise has one, as well as the sides of the pavilion, but these latter ones project from the facade, and each has a roof and supporting columns, giving it the aspect of a veranda.

In addition to iron, the use of which was made obligatory, and which the builders have used not only as a framework, but also for decorative purposes, in various parts of the edifice, the materials that enter into the structure are terra cotta, compressed beton, bricks, tiles, slabs of plaster, and wood, the latter in very small proportion and only where the use of it was indispensable. Naturally, all these materials are employed either in panels or in portions of very definite

form, in order to render the taking down of the structure in France and its re-erection in Chili as rapid as possible.

In order to give the structure great stability, as well as great rigidity, and at the same time save material, the architects have made their framework double walled, with an intermediate space. This system has also the advantage of protecting the interior of the halls against the differences (often excessive) that the external temperature is subject to.

It is to be hoped the United States will not be backward in providing a suitable national pavilion. We believe no steps have yet been taken. If



PAVILION OF THE REPUBLIC OF CHILI AT THE PARIS EXPOSITION OF 1889.

anything is to be done, it should have immediate attention.

## Idaho Streams that Vanish.

One of the peculiar features of Idaho scenery is the frequent occurrence of dark rocky chasms and channels of lava into which streams and rivers plunge and are apparently forever lost.

These fissures are supposed to be old lava beds. The outside of the molten mass cooled and formed a roof, the fiery stream below became exhausted, leaving an empty chamber. A break in this roof having occurred, an opening was formed into which the river or stream now disappears, to reappear as a mysterious lake, basin or spring on some distant mountain or plain.

On the banks of the Snake River one of these streams reappears, gushing from a high cliff in a cataract to the waters below.

## The Practical Limit of Speed.

The highest speed practically attainable in daily service with passenger trains has always been a point on which much discussion has been raised. The recent race between London and Edinburgh seems, however, to afford a tolerably complete solution of the problem. The official figures, giving the actual time and load for each day of the run, when analyzed, give the following average results for the London and Northwestern route from Aug. 6 to Aug. 31 inclusive. During this time the schedule time was 8 hours for the 400 miles, and the train arrived in Edinburgh ahead of schedule time on 22 days and was 37 minutes late on one day

only, owing to a flue on the locomotive collapsing. With this exception, the running was remarkably regular, the trains arriving within 1 minute for 11 days in succession. The average speed for the whole period was a fraction over 50 miles per hour including stops, and slightly under 55 miles per hour excluding stops. The average time occupied in the three stops was 40 minutes, one stop being for dinner. The train consisted of four eight-wheel cars, with F. W. Webb's radiating axles. The cars were each 42 ft. long over bodies and weighed 42,500 lb. each. Three different classes of engines, weighing respectively 61,000, 76,000, and 94,000 lb. in working order, were employed on different portions of the route, the lightest engine running over the lightest grades. The minimum weight of engine, tender, and train was 287,000 lb. and the maximum 339,000 lb., the average being 305,000 lb. The grades varied considerably, the worst being one 9½ miles long averaging 67 ft. per mile, and another 4¼ miles long of 70 ft. per mile. The best performance over the section containing the former grade was 101 miles in 104 minutes (which was done on three occasions), and over the latter 90 miles in 90 minutes, in both cases from start to stop. The fastest run over the more level portion was 158 miles in 166 minutes, start to stop, or 14 minutes under schedule time. The feat appears to have been so easily

performed that on the Northwestern it was not considered necessary to employ the compound engines, and the fast running was done with comparatively old engines of far less weight and power than the compounds, which were reserved for the heavier trains. These facts merely emphasize what has repeatedly been urged in these columns—the importance of good signals, which aid fast running far more effectually than heavy engines.

It will thus be seen that with a light train, stoppages averaging 100 miles apart, good permanent way, and somewhat severe grades on the northern portion of the journey, a speed of 50 miles per hour, including stops, was maintained with ease. This certainly marks a considerable advance on previous practice, and shows that where sufficient inducement offers, modern railroad appliances are capable of approaching very closely to the apparent limit of a mile a minute.—*Railroad Gazette*.



## THE NEW "TIMES" BUILDING.

The original building, erected in 1857, was one of the noticeably beautiful structures of the city at the time it was built. It was also well built, and substantially fireproof. This substantial and beautiful five-story structure is now, however, practically demolished, and in its place a new one, thirteen stories high, has been erected. Our first page illustrations show the novel method which has been followed in the demolition and rebuilding, with a view in perspective of the completed structure.

The ground space measures 96 feet on Nassau Street, 60 feet on Spruce Street, 102 feet on Park Row, and 104 feet on the line of the adjoining Potter building, which was put up with an extra thick wall on this side, to serve as a party wall between the two buildings. Besides this space occupied by the *Times* building on the street line, a basement and sub-basement extend under the sidewalk 16 feet on Nassau Street and 20 feet on Park Row, while on the Spruce Street front there is a single basement, 30 feet wide by 90 feet long, of which the stone floor is 25 feet below the brick and iron arched ceiling which separates it from the sidewalk and street above. This is the *Times* press room, and has been maintained substantially intact, so that operations on the new building have but little interfered with the work done in this department.

The manner in which the outer walls and sufficient of the interior of the old building were removed, to make way for the walls of the new structure, while the floors were strongly supported to allow of the occupancy of the old building without interruption, for all the uses necessary in the publication of a great daily newspaper, are shown in one of the views, and the successful prosecution of this work without interfering with the business of the *Times* has furnished a novelty in the building line occasioning general comment. In other words, a new thirteen-story building was erected upon the site and in place of the old five-story building, and the new structure was put up without disturbing the main portions of the old establishment, and while the latter continued to be occupied. But it had been decided that it would be impracticable to move the business of the paper into new quarters, and therefore this novel plan of building was adopted, the work being undertaken by Mr. George B. Post, architect, and Mr. D. H. King, Jr., contractor and builder.

Operations were confined, at the first, to the laying of the new foundations, the walls of the old building being sufficiently shored up for this purpose. These foundations consisted of twelve piers on the three fronts and ten interior piers on the lines of three partition walls, which had formerly extended from Nassau Street to Park Row. The foundations of the piers on the street line are in each case nine feet wide, and in the case of the central one on Park Row, above which is the main entrance, the foundation is also 15 feet long. The site is a natural sand bed, and the piers, which are built of brick up to just below the sidewalk level, were each started on a bed of cement and broken stone three feet thick. The central piers, on the line of the partition walls in the old building, were to be used in the new building as foundations for iron columns carrying girders, the new structure not having any partition walls. These central piers, in three lines from Nassau Street to Park Row, are connected at their base by inverted arches, and they were extended sufficiently on both sides of the foundation of the former partition walls for each one of them to form the base for two iron columns, to be extended up, one on each side of the old interior walls, these columns being thus carried up in pairs, tied together with stiff plates on each floor, to the fifth story.

The work of building the new foundations, up to about the sidewalk level, having been completed without apparently affecting the stability of the old building, or interfering with the regular business done in it, the work was commenced in public view, on the outside of the building, by the construction of a stout wooden bridge on its three fronts, the bridge being capable of holding several derricks, a hoisting engine, the heaviest blocks of stone, etc., and at the same time derricks were placed on the top of the building for use in removing and lowering the stone of the old walls. These had been built of an excellent quality of Nova Scotia freestone, and the stone was in almost perfect condition after its thirty years' exposure to the atmosphere. Some of the single stones weighed as much as  $3\frac{1}{2}$  tons.

At the same time that the workmen commenced the removal of the roof and the old walls, a temporary roof was being provided inside the building, over the southern half of the fifth story and the entire fourth story, which were to afford the working rooms for the compositors, editors, and reporters while building operations were in progress. This roof was of timber, covered with tarred paper and tin, and temporary board sidings, also covered with roofing paper, inclosed the various floors on the sides toward the street. The temporary accommodations thus provided, although not very inviting in appearance, and not so readily accessible as might be desired, were quite sufficient for the carrying on of the daily work of the paper.

The interior of the old building was for a time entirely supported by the partition walls, themselves shored up by vertical lines of shoring from the basement up, and by the party wall on the south, independent of its three former outside walls.

The new building is of granite for the first two stories and of Indiana sandstone above. Commencing on the granite piers at the top of the second story, a heavy wrought iron hexagonal segment column is carried up in each pier opposite the old partition walls, on the Nassau Street and Park Row fronts. These columns form anchorages in the side walls, to which



JOHN BUNYAN'S PULPIT, FORMERLY IN THE OLD MEETING HOUSE AT LAMBETH.

are secured cross girders, resting on the three rows of pillars extending from side to side in the interior, these girders forming the floor supports in place of the old partition walls. The floors of the new building being of the same height, respectively, as those of the old, it has been a simple matter, as the outside piers were carried up, and the vertical columns in line therewith on the inside, to transfer the load sustained by the shoring and the old partition walls to the girders designed to carry the interior weight in the building. The floor beams are similar to those used in the old structure, and most of these have been used in the new building, but, instead of the brick and mortar arches, a hollow brick is used to make a flat arch and corresponding flat finished ceilings.

The double iron columns resting on the central piers are only carried to the fourth floor on the line of piers nearest the Spruce Street front, while on the two other lines of piers these double columns reach to the fifth floor, single columns being carried up therefrom, in each case for the several stories above. These columns, made of six plates each, rolled to shape as segments of a circle, with longitudinal flanges and solidly bolted



OLD MEETING HOUSE AT LAMBETH.

together, are all exceptionally heavy, as are also the cross girders resting upon and strongly bolted to them and to the anchorages in the side walls. This plan of building also leaves each floor free from any obstruction, except such as made by the columns, affording ample light from the windows on three sides, while giving opportunity for the most advantageous subdivision of the room into various sized offices and business apartments.

The thirteenth story of the new building will be 23 feet from floor to ceiling, its windows looking out above the highest structures of the city on all sides, and its slate and iron roof pierced with several skylights. This story will be occupied, as was the top

floor of the former building, by the composing room of the *Times*, and the 100 or more printers and proof-readers there employed have reason to expect that, in the new structure, theirs will be the finest workroom of its kind in the world.

There will be three hydraulic passenger elevators, which, with the stairway, will be on the line of the party wall on the south, midway between Nassau Street and Park Row. The building will be always open, as work in a great newspaper office never ceases. A large proportion of the leading newspapers of the country also have offices in the immediate neighborhood of Printing House Square, the new structure being at the very focus of, perhaps, the most pronounced and most constant activity of any portion of New York City.

The rapidity with which the work was pushed, from the day on which its prosecution first became apparent to the public, was quite remarkable. The possibility of accomplishing the work at all, however, and carrying on the publication of the paper on the premises at the same time, was due principally to the fact that the press room, under the sidewalk and street of the Spruce Street front, was substantially undisturbed by the building operations.

The *Times* is printed on five Walter presses, each printing from a continuous roll of paper, and each press occupying a floor space of about 8 by 12 feet. A small, incased, upright engine is placed near and geared to each press, a small pipe furnishing steam at about 70 lb. pressure, giving ample power, and the engines taking up so little room in each case as to seem almost a part of the press. These presses are capable of printing 20,000 copies per hour each, and this capability has been constantly maintained in the press room, notwithstanding the aspect of chaos prevailing above. The *Times* newspaper, therefore, has in no particular borne evidence of the somewhat remarkable conditions under which it has been produced while its old quarters were undergoing demolition and the walls of its handsome new structure rising above those of all its neighbors.

## OLD MEETING HOUSE AT LAMBETH.

The quaint old building of which we give an illustration, and which has just been pulled down, stood in Lambeth road, opposite St. Mary's church, London. It was doubtless the remains of what must at one time have been a famous hostelry. In the courtyard of this old inn "Lambeth Fayre" was held; and the immediate neighborhood has associations of much historical interest. No doubt the old building stood there in 1641, when the London apprentices attacked Lambeth Palace opposite and tried to capture Archbishop Laud. Close to this old building, too, Mary of Modena, Queen of James II., rested in 1688, when she fled from the palace on the other side of the river, disguised as an Italian washerwoman, with her infant son in her arms. During a long period the upper room of this old building was a nonconformist meeting place, and in comparatively recent years it was the scene of much useful and unselfish labor. For many years this old "meeting room" contained the pulpit of John Bunyan. This pulpit had been removed from the old nonconformist meeting house in Zoar Street, Southwark, where Bunyan used to go when he visited London, and where he was allowed to deliver his discourses, by favor of his friend, Dr. Thomas Barlow, Bishop of Lincoln, to whom the old Southwark house belonged. It is not known what has become of this old pulpit.

Mr. Watts, of Messrs. Doulton & Watts, founded here a ragged school, which was frequently taught by Mr. W. R. Selway, now a prominent member of the Metropolitan Board of Works. Here Mrs. Carlile, the founder of the "Band of Hope" movement, taught a class of children, and the room might almost be called the birthplace of the temperance movement on the Surrey side, as it was the scene of the labors of Meredith, Howlett, and other pioneers of teetotalism. John Mountford, one of the most zealous followers of the Rev. Rowland Hill, held together a congregation in this old building until his death at an advanced age. Recently the old building was a coffee shop, and a coffee tavern will be erected on the site.—*Illustrated London News*.

## Ventilation of Cow Stables.

An interesting fact is reported by the proprietors of a dairy at Frankfort on the Main, in Germany, which should become familiar to the farmers and dairymen in this country. In a standard stable eighty Swiss cows were kept, the feed and treatment being extraordinarily good. In the years 1877, 1878, and 1879, a record of the milk yielded showed on an average, per cow, 3,700 quarts in 1877, the same in 1878, and 3,716 quarts in 1879. A system of ventilation was then introduced into the stable, but the feed and attendance remained the same. For the next three years a record of the milk produced was also kept. In 1880 the average yield per cow was 4,050 quarts; in 1881 4,152, and in 1882 4,354 quarts. This is a gain of from ten to fifteen per cent., and should induce those who keep animals to provide better homes for them.



A RESIDENCE AT WORCESTER, MASS.

Our illustration shows the dwelling of Mr. J. F. Bicknell, which is 9' 6" in clear in first story, 9' in second story, 9' 6" in attic, and 8' 6" in cellar.

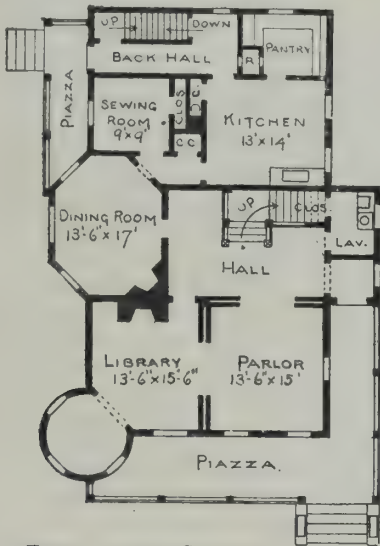
Roof is shingled and painted; front hall and dining room are finished in quartered oak, parlor and library in red birch, and the remainder of first story in ash.

Second story is whitewood, finished natural color of wood. Attic is unfinished, except hall and billiard room, 17x22½, in gable over octagonal bay window, also finished in whitewood.

There is a laundry in cellar, and cellar bottom cemented. It is heated by steam. Cost about \$8,000. Architects, Barker & Nourse, Worcester, Mass.

Polishing Granite.

The form is given to the stone by the hands of skilled masons, in much the same way as is done with other stones of softer nature. Of course the time required is



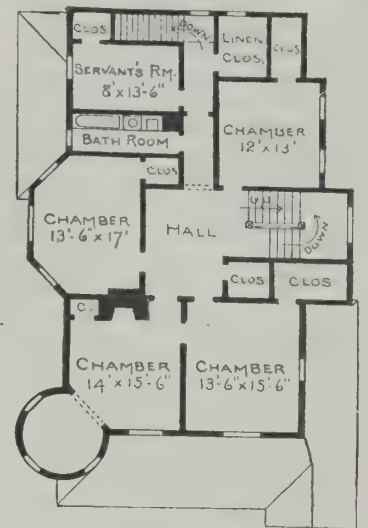
FIRST FLOOR PLAN.

and pendulums or rubbers. The lathes are employed for the polishing of columns, the wagons for flat surfaces, and the pendulums for moulding and such flat work as is not suitable for the wagon. In the lathe the column is placed and supported at each end by points, upon which it revolves. On the upper surface of the column there are laid pieces of iron, segments of the circumference of the column. The weight of these pieces of iron lying upon the column, and the constant supply by the lathe attendant of sand and water, emery or putty, according to the state of finish to which the column has been brought, constitute the whole operation. While sand is used during the rougher state of the process, these irons are bare; but when using emery and putty, the surface of the iron next to the stone is covered with thick flannel.

The wagon is a carriage running upon rails, in which the pieces of stone to be polished are fixed, having uppermost the surface to be operated upon. Above this surface there are shafts placed perpendicularly, on the lower end of which are fixed rings of iron. These rings rest upon the stone, and when the shaft revolves they rub the surface of the stone. At the same time the wagon travels backward and forward upon the rails, so as to expose the whole surface of the stone to the action of the rings. The pendulum is a frame hung upon hinges from the roof of the workshop. To this frame are attached iron rods, moving in a horizontal direction. In the line upon which these rods move, and under them, the stone is firmly placed upon the floor. Pieces of iron are then loosely attached to the

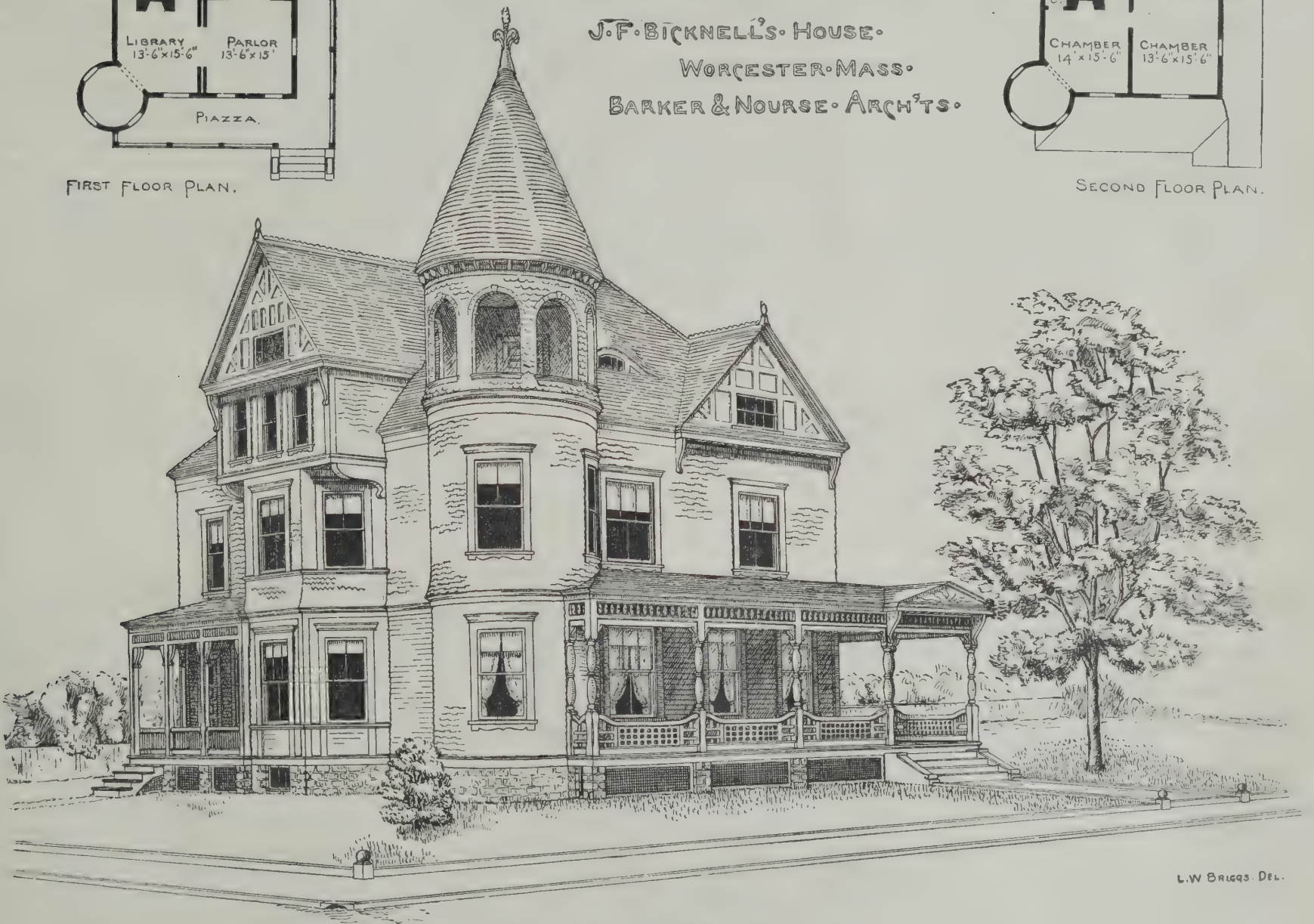
Alleghany Mountains; and south of the Ohio and north of the Gulf States it has always been the best local building material. The attention which is now paid to yellow poplar, however, is much more general, and the manufacturers of this lumber are active in their efforts to secure logs and regulate the price of the manufactured lumber. But yellow poplar is not destined to play any very important or leading part in the lumber supply of the United States, and the future of the business is hardly worth considering. The tulip tree does not form forests by itself, and is not even a considerable element in the forest anywhere. The trees are often very large, but they are widely scattered, and the most accessible have already been cut. There are still great quantities, in the aggregate, of this timber standing, but much of it is now almost too inaccessible for profitable manufacture.

Basswood, or linden, a soft and easily worked wood, which is found in considerable abundance in the ex-



SECOND FLOOR PLAN.

J.F. BICKNELL'S HOUSE.  
WORCESTER, MASS.  
BARKER & NOURSE, ARCH'TS.



A RESIDENCE AT WORCESTER, MASS.

considerably greater in the case of granite as compared with other stones. If the surface is not to be polished, but only fine-axed, as it is called, that is done by the use of a hammer composed of a number of slips of steel of about a sixteenth of an inch thick, which are tightly bound together, the edges being placed on the same plane. With this tool the workman smooths the surface of the stone by a series of taps or blows given at a right angle to the surface operated upon. By this means the marks of the blows as given obliquely on the surface of the stone are obliterated, and a smooth face produced. Polishing is performed by rubbing in the first place with an iron tool and with sand and water. Emery is next applied, then putty with flannel. All plain surface and moulding can be done by machinery, but all carvings, or surfaces broken into small portions of various elevations, are done by the hands of the patient hand polishers.

The operation of sawing a block of granite into slabs for panels, tables, or chimney pieces is a very slow process, the rate of progress being about half an inch per day of ten hours. The machines employed are few and simple. They are technically called lathes, wagons,

rods, and allowed to rest upon the surface of the stone. When the whole is set in motion, these irons are dragged backward and forward over the surface of the stone, and so it is polished. When polishing plain surfaces, such as the needle of an obelisk, the pieces of iron are flat; but when we have to polish a moulding, we make an extra pattern of its form, and the irons are cast from that pattern.—*The Stonemason.*

Substitutes for White Pine.

White pine lumber is high enough to cause anxiety among lumbermen, and to compel them to find some cheaper and more available material to take its place. The most immediately available wood for this purpose is yellow poplar, as the wood of the tulip tree is called commercially. It is light and soft, straight grained, and easily worked; it stands well, and when it is not painted it turns with age to a deep rich color. Nashville, in Tennessee, has always been the important manufacturing point for this lumber, as the tulip tree is found in its greatest perfection along the banks of the streams which flow down the western slope of the

treme Northern States, is now used to replace white pine in the manufacture of mouldings and similar objects, for which it is well suited. The quantity of basswood, however, is too small to make this tree really important as a factor of the national lumber supply.

Much attention has been paid in late years, as has already been explained in these columns, to cottonwood, Southern cypress, and sweet gum as substitutes for white pine. Sweet gum will probably be very largely used before many years, and for some purposes, like flooring strips, it will make an excellent substitute for white pine. The supply, too, is large, and it is likely to last, as the gum tree grows on land which cannot be used for agricultural purposes.

But the real substitutes for white pine, or rather the only trees now growing on this continent in sufficient quantities ever to take its place, are the long-leaved pine of the Southern States and the Oregon fir of Puget Sound. These are the trees upon which the American people will have to depend during the twentieth century, or until they are exhausted or a new crop of white pine grows up in the Northern States and in Canada.—*Garden and Forest.*



**PASSIFLORA CÆRULEA (HARDY PASSION FLOWER).**

The hardy blue passion flower (see illustration) so common as a wall climber in the south and mild districts, is one of the chief among our selection of open air climbers, for, apart from its graceful growth and its flower beauty, it is so different from all other outdoor plants that it should be grown in every garden where the climate permits. We have indeed seen it as a trailing shrub in southern gardens, the long shoots being allowed to run over a sunny bank facing south, and in such a position the plant flowered abundantly, and produced a crop of its rich yellow fruits about the size of plums. It is not so suitable for planting to run over arbors or trellises as for a wall covering, as the heat of the wall seems to aid in ripening its growth, and so enables it to withstand our winters. A southern aspect is always best for it, though it flourishes against west or east walls. The only culture it requires is a good soil, nailing the shoots, and, if necessary, a slight protection during winter. There is now a lovely white flowered variety, named *Constance Elliott*, which is quite as hardy as the original form. The flowers are entirely of ivory whiteness, and are very freely produced. Being as yet rather uncommon, it is confined mostly to the greenhouse, but no one need hesitate to plant it against a sunny wall. There is no other variety of *P. cærulea* so distinct as this, and no other passion flower hardy enough for outdoor walls. The blue passion flower first came from Brazil two hundred years ago.—*The Garden*.

**Ivy on Buildings.**

No greater fallacy exists in respect to the ivy than that it is destructive to buildings, of whatever material these may be composed. It is popularly considered just as injurious to the ruined tower or abbey as to the wooden cottage or villa, though it is as harmless, and more so, than the Virginian creeper which is allowed to ramble unmolested into every nook and corner. The greatest use of the ivy is for the purpose of adornment. What beauty is there in a tower or ruin without its mantling of ivy, that keeps the stonework from crumbling, and gives a delightful picturesqueness, such as every other creeper fails to do? These few remarks are prompted by what I saw recently at Rievaulx Abbey, a famous monastic pile in Yorkshire, and one, perhaps, of the most beautiful of the ruined abbeys in that county. In the course of repairs it was thought fit to remove the ivy that mantled over the crumbling walls at the east end of the magnificent ruins, and it was therefore shorn of much of its beauty. It was done no doubt by a person who was not sufficiently versed in the ivy to recognize its preserving qualities. It should certainly be kept from hiding delicate tracery, windows, or doors of architectural interest, but to tear it from a bare wall is needless interference with a climber that shields from rain, snow, and storm. But there are certain things on ruins that should be removed, and those are the mural trees that we occasionally find flourishing at the summit of some ancient pile. Trees serve no useful purpose; they neither protect nor preserve; but send their roots into the mortar, in this way loosening the bricks or stones.—*E. C., The Garden*.

**DESIGN FOR A HOTEL AT RICHMOND, VA.**

We give from *Building* a sketch for a proposed hotel at Richmond, Va., by H. L. Page and W. W. Kent, architects, New York. It is an attractive and excellent design.

IN connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

**THE NEW MUNICIPAL BUILDINGS, GLASGOW.**

Glasgow is ambitious to be second only to London, and the new municipal buildings lately inaugurated by the Queen are the greatest architectural work of the century in Scotland, and the largest building erected in the United Kingdom since the completion of the Royal Courts of Justice in London. The execution of the work has occupied more than five years, and the cost of the buildings exceeds 500,000*l*. The design was selected in an open competition, in which 125 designs

**THE HARDY BLUE PASSION FLOWER.***(Passiflora cærulea.)*

were sent in; and the author of the selected design, Mr. William Young, of London, has carried out to completion a building of which the people of Glasgow are justly proud.

The building occupies one of the finest sites in the city, on the west side of George Square West, and has frontages to George Square, George Street, John Street, and Cochrane Street, with a beautiful quadrangle in the center of the block. The whole design is a free treatment of Italian Renaissance. Each front, both to the streets and the quadrangle, is different in design, giving individual character to each of the *facades*, while, at the same time, unity is given to the whole composition by repeating the four corner towers, and a skillful grouping of the masses in the general composition. The architect has throughout aimed at avoiding ornamental carving, with a view to introduce sculpture as much as possible; and this has been done to a larger extent than in any modern building.

The sculpture subject in the central pediment represents the jubilee of Queen Victoria, and was executed by Mr. G. A. Lawson during the jubilee year. The spandrels of the arches to the windows of the principal floor have figure subjects, more than life size, representing the various trades and industries of the city; while over the principal entrance there is a frieze sixty feet long, representing Religion, Virtue, and Knowledge, supporting the Glasgow coat of arms, "Let Glasgow flourish."

The interior of the building has been as carefully studied as the exterior. The principal entrance is

through a noble loggia, sixty feet by sixty feet, divided into three bays by granite columns, and intersected by a transept. The ceiling is groined, with domes at the intersection of the transept arches, and is entirely executed in Venetian mosaic, the walls being of stone, relieved by granite and marble. This loggia leads to the two principal staircases, that to the banqueting hall having the walls, balustrade, and floors entirely of marble and alabaster; the other stair, to the council chamber, being executed of stone and alabaster.

The principal rooms have been carried out in a manner worthy of the building, some having panelings of satin-wood, and others of amber-wood, mahogany, teak, and walnut.

One of the principal corridors, executed in *faience*, is one of the most beautiful specimens of this class of work.—*The Graphic*.

**THE INTERNATIONAL EXHIBITION AT GLASGOW.**

The International Exhibition at Glasgow, opened by the Prince and Princess of Wales on May 8, is the largest that has been held in the United Kingdom since the London International Exhibition of 1862. The buildings and grounds occupy sixty-six acres, in the Kelvin Grove Park, the main entrance, facing northeast, being nearly opposite the Glasgow University buildings, which are on Gilmore Hill, on the other side of the stream. From that direction the grounds are reached by a broad esplanade from a gateway in Bank Street, Hillhead; but the exhibition palace can be entered immediately either on its east side, in Gray Street, or from Sandyford Street, in the center of its south side. The building is 1,300 feet long and 265 feet wide, comprising a nave and transepts, with an iron dome 170 feet high and 80 feet in diameter, and with ten towers, which are 200 feet high, and are partly of brick. The remainder of the building is chiefly wooden.

It is in the Saracenic or Moorish style of architecture, with arches of horse-shoe form, polygonal domes or cupolas, minarets and pinnacles, and appropriate decoration, painted internally with a rich cream color, relieved by deep red and rich dark brown, except the dome, which is painted red, blue, yellow, and green, and its framework apparently gilt. The main avenue, from east to west, is more than a quarter of a mile long, 60 feet wide, and 43 feet high. The transepts, from the grand entrance to the south entrance, are 215 feet, and of the same width as the nave. The dome, rising from four substantial towers, is well proportioned. Its converging arches are adorned with the armorial bearings of Great Britain, France, Germany, the United States, Canada, Australia, South Africa, and India, and on circular panels below are four allegorical figures—Science, Art, Industry, and Agriculture. Scripture texts, speaking of the manifold works of God, and acknowledging that the manifold works of man are the gift of God, are inscribed over the four great arches under the dome. In the center is a fountain, with a circular promenade around it. A chandelier with eight electric lamps gives it light in the evening.

At the east end of the main avenue is the grand hall, 200 feet long, 96 feet wide, and 60 feet high, with side

galleries, an orchestra, and a fine organ, built by Messrs. J. W. Walker & Sons, of London. The decoration is in red and yellow, with festoons of red and blue cloth, fringed, heraldic shields and trophies, and canvas panels, filled with colored ornamentation of Moorish patterns. To the south of the grand hall is the Fine Arts Section; the Picture Gallery and the Sculpture Gallery occupying a substantial brick-walled part of the building, made fireproof, and which may be permanent. At the west end of the main avenue, beyond the principal building, and north of the line of its front, is the Machinery Annex, 330 feet long and 286 feet wide.

The buildings altogether cover a space of 474,000 square feet, of which 268,000 feet are devoted to general exhibits of the various classes (manufacturing and commercial and articles of produce), 27,500 feet to the Fine Arts, 16,000 feet to the grand hall, 23,000 feet

**DESIGN FOR A HOTEL AT RICHMOND VA.**





THE NEW MUNICIPAL BUILDINGS, GLASGOW, RECENTLY OPENED BY HER MAJESTY.

to dining and refreshment rooms, and 140,000 feet to machinery, boiler sheds, and the like. Messrs. Campbell, Douglas & Sellars, architects, of Glasgow, and Mr. James Barr, C.E., furnished the design for these buildings. Messrs. W. Shaw & Sons, of Glasgow, were the contractors.

The different classes of articles in the Industrial Exhibition follow much the same order as that with which everybody is now familiar. For example, agriculture,

mining and quarries, engineering, shipping, machinery, carriages, cutlery, chemistry, food and liquors, textile fabrics, paper and printing, furniture, pottery and glass, jewelry, clocks and watches, fisheries, education, and musical instruments, each subject with others allied to it.—*Illustrated London News*.

**Petrified Wood in Texas.**

Mr. J. C. Melcher, of O'Quinn, Texas, sends us a pho-

tograph of an interesting collection of petrified wood, lately found in that vicinity. One of the specimens is 14 ft. high and 11 in. in diameter, and is almost pure white. There are also many large pieces, said to be parts of a tree trunk that was 40 ft. long and 3 ft. in diameter, but which had to be broken up to be moved. Some of the specimens are black and others translucent, and all are solid and hard, showing plainly the grain and markings of the wood.



THE GLASGOW EXHIBITION—VIEW FROM UNDER THE CENTRAL DOME.



ROMAN TESSELATED PAVEMENT AT BOX, ENGLAND.

This pavement, together with a handsome bath, was unearthed by Messrs. Stier & Son, at Box, transported to their premises at Bath for exhibition, and formed one of the archæological attractions of Bath during the meeting of the British Association. The pavement, together with the bath, was discovered in the December of 1881 and the January of 1882, in the middle of the village of Box, and evidently formed part of an old Roman villa, as other remains found also on the same spot clearly testify. The villa in question was on the line of Roman road leading to Cunetio (Marlborough) and Ilchester. A coin of Constantine discovered, bearing date A.D. 337, would stamp this as the probable period of both bath and pavement, thus making the discoveries about fifteen hundred and fifty years old. The pavement as now shown measures about 24 ft. long by 5 ft. wide, and of itself presents a beautiful as well as unique example of ancient mosaic art. Against the white cubes of tesserae, forming the body of the pavement, stands out in bold relief the dark blue key pattern running down through the center, while on the top portion of the pavement is a singular labyrinthine fret formed with the same dark blue tesserae on purer white. Examining the pavement on one side, a marked spot is discernible where the white cubes present a reddish hue, evidently bearing traces of fire. Arrived at the end of this corridor, for such the pavement really formed in the bathing portion of the above Roman villa, we now come to the bath. This is of a beautiful crescent shape, and adjoins the pavement, while in close proximity, when unearthed, were found the hypocausts and hot air flues. A great number of square bricks, which were also shown by Messrs. Stier, were discovered, the same forming the *stela* which supported the floor, while one could clearly determine the *calidarium*, *tepidarium*, and *frigidarium*. The dimensions of the bath, which is stated to be the only perfect tessellated Roman bath yet known, are as follows: The chord of the bow 3 ft. 6 in., the bow itself 11 ft., and the depth 2 ft. 8 in. Its sides and floor are laid with pure white tesserae, tesserae of even a finer kind than that in the pavement.—*The Graphic*.

SLOW BURNING CONSTRUCTION.

BY A. J. SHAW.

The essentials of approximately fire-proof construction are solid walls, heavy timbers, plank floors, brick or heavy plank partitions, and, in general, a rigid avoidance of hollow spaces or flues of any kind in walls, ceilings, or roofs. except, of course, flues and chimneys in brick walls. It is not of so much importance to put up buildings which absolutely cannot burn, almost a commercial impossibility, as to erect those which shall

closely spaced, as in the usual construction, but that the floors are made of heavy plank, carried on floor beams spaced from eight to ten feet apart, these beams resting directly on the walls and supporting columns. The roof is of similar construction, except that it has a



ROMAN TESSELATED PAVEMENT AT BOX, ENGLAND.

slope, usually of three-quarters of an inch to the foot, in order that water may flow off freely. The roof timbers project beyond the walls and are planked to the ends, in order to avoid the usual box cornice. The projection may be anything that the builder fancies, from nothing up to two or three feet. In some cases the walls are carried above the roof, which slopes toward the center, the water being carried off by pipes passing down through the center of the building. This construction has been found to give excellent satisfaction in very cold climates, in which the roof is likely to be covered with large quantities of ice and snow, as there is not so much trouble from freezing and "backing up,"

most prohibitive. Tin serves an excellent purpose, but although not the usual practice, it should be painted on the under side before laying. Asphalt roofing also gives excellent satisfaction when properly put on.

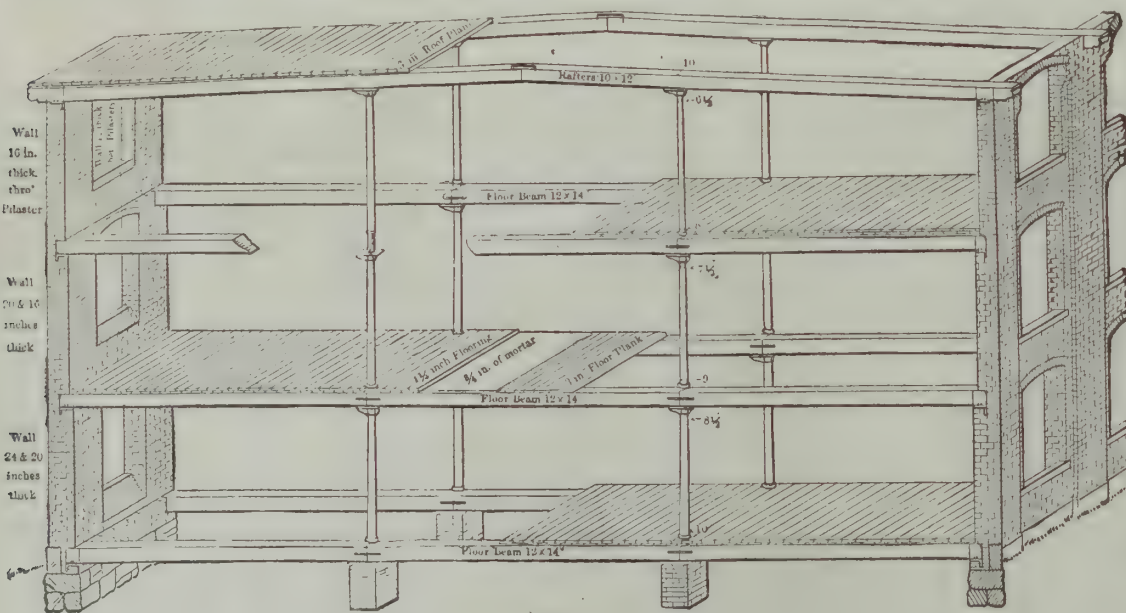
The value of a roof covering depends so much upon the quality of the materials and the care and skill with which they are used that these things are almost of more importance than the use of any particular kind. Slate roofs should not be used, as the slates break and fall off on the application of any considerable heat from the inside, or even from the heat of any considerable brand falling on the outside.

A very usual method of putting floor beams into the walls is to build their ends into the brickwork and tie the walls to them by bolts passing through washers on the outside. Another method is to bolt hooks to the under side of the beams, which turn downward into the brickwork. These both are defective, inasmuch as, when the floors go down, during a fire or from accident, they usually drag the walls down with them.

A construction which entirely does away with this danger, and at the same time stays the wall securely, is given in Fig. 2, which shows the standard practice of the best mill engineers. A cast iron plate, with a downward projecting rib at its rear end, is built solidly into the wall. This plate has another rib, on its upper surface, which projects into a gain cut, across the under side of the floor beam, to which it is securely locked by wedges driven on either side. In the cut, the end of the beam is shown beveled, but this is not always done, although it is considered the better way by many, as less likely to overturn the walls by the prying action of the upper corner, when the inner end of the beam goes down. A space of an inch should be left all around the timber for ventilation, as it is more subject to decay when built solidly into the wall. A ready method of making this space is to build into the wall, around the timber, pieces of one inch board which have been soaked in water. When dry, they can be removed very easily.

It has been found better to make the floor beams in two pieces of, say, 6"×14" timber, placed side by side and separated by a space of half an inch to an inch, rather than to use solid beams 12"×14" in section. It is easier to obtain sound timber of the smaller dimensions, it will warp and twist less, and be less subject to dry rot than if solid. The beams should be separated by small slips of wood placed between them when they are bolted together.

An enlarged section of the floor is shown in Fig. 3. The under floor is of three-inch plank, planed on, at least, the under side, and grooved on the edges. Into



*Fig. 1.*

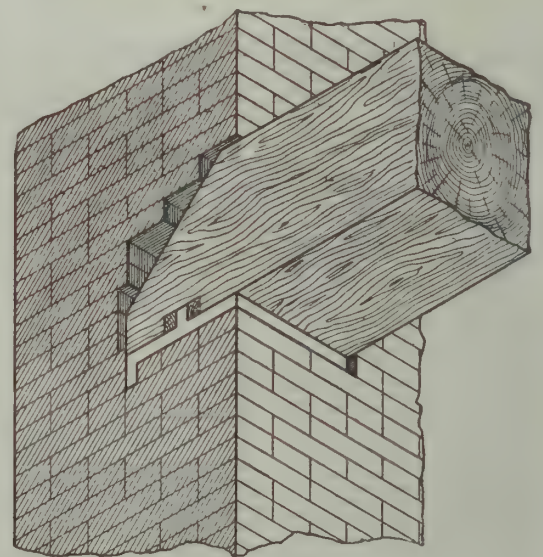
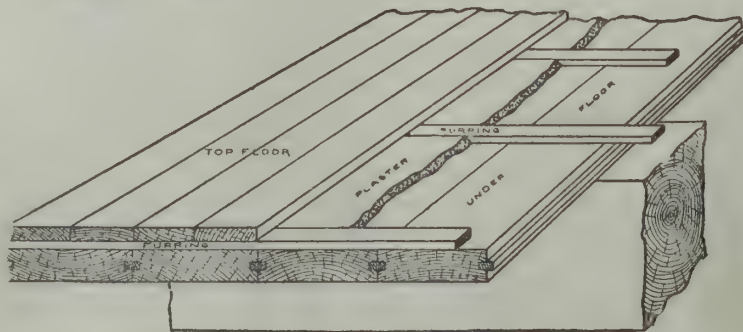


Fig. 2.



*Fig. 3.*

burn so slowly as to allow ample time for the putting out of any fire which is likely to occur, before it gets beyond control.

Better examples of the most approved method of accomplishing this cannot be found than are furnished by the mills and factories under the care of the New England Manufacturers' Mutual Insurance Companies, whose motto and aim is to prevent fires, in preference to paying losses caused by them. Their success has been such that they have reduced the cost of insurance on what is naturally a hazardous class of risks over eighty per cent. While many of the details applicable to buildings erected for one class of uses may not apply to those erected for another, nevertheless, many of the general arrangements must be common to factory buildings of all classes, and a few of the most important of these will now be given.

Fig. 1 represents a cross section of an ideal cotton mill building, taken, by permission, from C. H. J. Woodbury's "Fire Protection of Mills," a standard work which should be read by every one interested in mill building. It will be noted that there are no floor joists

as is often had when the water flows to the outside. It is better not to use eaves troughs, as they are nearly always a nuisance, full of dirt and expensive to maintain. For buildings on streets where the dripping of the water from the eaves on the sidewalk would be objectionable, the roof may slope entirely to the back or discharge to the center.

As a material for roof covering, tar and gravel, when well applied, is perhaps as good as anything. Copper is the best roofing material known, but its cost is al-

the grooves are driven hard wood splines. The plank should span at least two bays and should be laid to break joints. The top floor, of birch, maple, or hard pine, may be, and often is, laid directly on top of the under floor, with the interposition of asbestos paper or other fire-proof building felt; but the best construction is the one shown in the cut, in which the top floor is laid in plaster three-quarters of an inch thick, floated off level by means of furring strips, through which the top floor is nailed. An increase of stiffness is gained if the top floor is laid diagonally, but as relaying is thereby rendered more difficult, on account of projection under machinery of the boards receiving the most wear, in the walks and passages, this is not usually done.

It is practically impossible to burn through a floor of this kind from above, and it will resist for a long time an attack from below. If laid without the plaster filling, it is as cheap as a floor of equal strength of the usual construction, and cheaper than the ordinary floor lathed and plastered underneath. It is neater and cleaner, and, not the least of its advantages, belt holes



can be cut anywhere, with the greatest facility, without seriously weakening it.

If the room beneath this floor is used for the storage or manufacture of combustible materials in sufficient quantity to make a very hot fire, the ceilings and beams should be protected by plaster, spread on wire lathing or netting, which follows the outline of the timbers and floors. A floor of this description will stand longer, when exposed to a fierce fire, than one of iron, unless the iron is thoroughly protected by terra cotta blocks, or in some other equally efficient manner.

The value of metallic as compared with wood lathing was well shown in a recent test in Philadelphia. A substantial two-story brick building, about eight by twelve feet in plan, was erected, divided into two compartments by a stout wall through the center. The ceiling of one compartment was constructed of wooden laths nailed to joists and plastered in the usual manner. The ceiling of the other was plastered on wire cloth. The top of the structure was left open, in order to permit inspection during the progress of the test. Equally hot fires were built in each compartment. At the end of ten minutes, the wooden lathing had burned away, the plaster had fallen and the beams were badly charred. In the other compartment, in which the wire cloth had been used, it and the plaster remained intact, and as far as its power of resisting fire was concerned, had not been seriously injured at the end of an hour, when the fire was allowed to burn itself out. From this it would appear that walls and ceilings plastered on wire netting are practically indestructible by fire acting against their outer faces.

The columns should be of wood, in preference to iron, and are better square than if turned, as they are nearly one-third stronger for a given diameter, besides saving the cost of turning. A one and one-half inch hole should be bored longitudinally through the center of the column, from end to end, and one-half inch holes bored transversely through the top and bottom for ventilation. Columns treated in this manner will season much more evenly, check less, and are less likely to decay than if left solid.

The floor timbers should rest on cast iron caps, and the foot of the column above should rest, not on the top of the floor timbers, but on a cast iron pinle, or block, extending down to the top of the lower column,

between them. It is very important that the columns be faced off square and that the caps have a fair bearing over the entire end, as posts loaded eccentrically are capable of sustaining only a fraction of the load which they can carry under proper conditions.—*Milling Engineer.*



#### CHURCH AT RICHMOND HILL, LONG ISLAND.

Our engraving, which was prepared direct from a photograph of the building, represents a perspective and floor plan of the Episcopal church at Richmond Hill, Long Island, built at a cost of \$4,000.

The extreme length of the building is 62 feet; the width is 42 feet.

There is a cellar under whole of the building, which is cemented and contains a furnace. The foundation walls are of stone. The underpinning is of brick.

The exterior is covered with matched stuff, put up perpendicular, and the joints are covered with a neat moulding.

Clapboarding and shingles could be introduced as inclosing to a pleasing effect without adding much to the cost.

The robing room is 10 x 12, and can be used as a study or a class room. The auditorium is 24 x 36, and, with the pews arranged as shown on plan, they will seat 175 persons. With aisle chairs 225 seats are obtained.

The choir and organ room is on the right of the altar. The robing room is on the left.

The woodwork throughout is of yellow pine, and is all finished in the natural wood. The roof beams and the bracing, etc., are neatly dressed, cut, and chamfered.

The windows are glazed with stained glass in plain colors, while the windows at the back of the altar are glazed with art glass.

The tower at the left of entrance bell, and is also used as ventilation.

An English court has just decided that railway servants cannot eject persons from trains who say they have lost their tickets, the only remedy being to sue the passenger for breach of contract.



CHURCH AT RICHMOND HILL, LONG ISLAND.



A BARN AND CARRIAGE HOUSE FOR \$800.

Our illustrations show a barn and carriage house built at Richmond Hill, Long Island, at a cost of \$830.

It is pretty in appearance, and the plan is well arranged.

There is an underpinning of local brick, laid on stone footings, and neatly pointed up.

The frame exterior is covered with sheathing, and then the first story is clapboarded, while the second story is shingled.

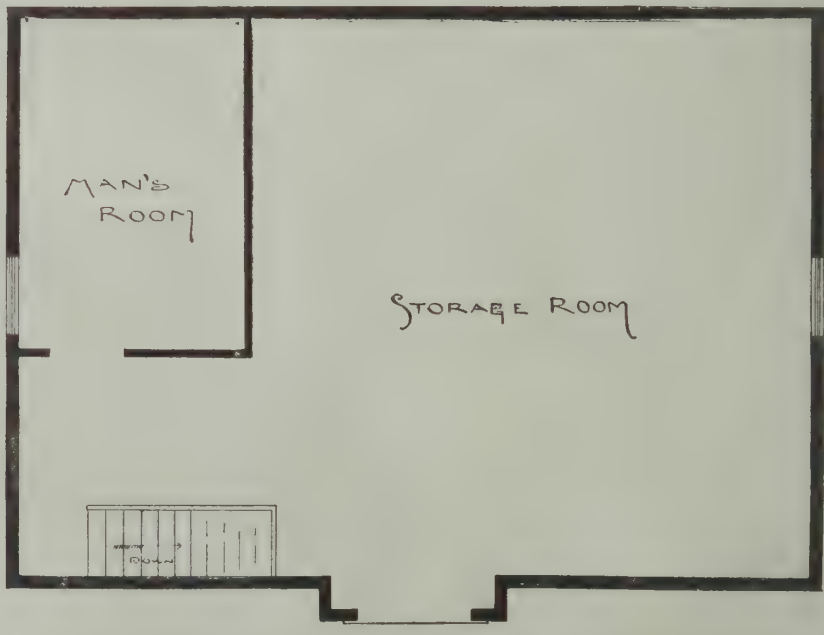
Hedges of Flowering Plants.

Hedges formed with evergreens are commonly met with, but evergreen and deciduous flowering shrubs are not much used for the purpose. I do not say that they are always admissible where non-flowering plants are used, but I think that flowering shrubs should have the preference when divisional lines are required in the pleasure grounds or to divide the vegetable ground from the rest of the garden. We might make good use of many of the quick-growing, deciduous flowering shrubs

With regard to deciduous flowering shrubs, one has only to see the crimson-flowering currant (*Ribes atrosanguineum*) and *Forsythia fortunei* growing and flowering side by side in the spring to be convinced how effective these plants would be grown as a hedge either together or separately. In sheltered situations *Leycesteria formosa* would make a beautiful hedge, and *Hydrangea paniculata* grown in this way and lightly pruned would have a pretty effect. The pink and white weigelas and the mock orange (*Philadelphus*), if not



FIRST FLOOR



SECOND FLOOR

A BARN AND CARRIAGE HOUSE FOR \$800.

The roof, with gables and dormer window, is shingled.

The barn is painted in a dark olive green, while all the shingles are left to weather-stain.

There is a carriage room, 21 x 24, fitted up with harness hooks complete, one large box stall with an earth floor, which can be divided by swinging poles.

Stairs lead to second floor, which has a large storage room for hay and feed, besides a man's sleeping room.

The partitions are all ceiled with narrow beaded white pine.

and roses in such positions. The suitability of the common and hardy kinds of roses to form a hedge is well illustrated in a garden near here, where there is a hedge nearly 200 yards long formed with many sorts of roses, including several varieties of the Scotch brier. York and Lancaster, Maiden's Blush, the old pink moss, the cabbage, and various other kinds. If left undisturbed for a few years, these roses will send up a lot of suckers, by which it is easy to increase their numbers. This hedge in the season produces more roses than can be found in any other garden for many miles around.

pruned too hard, will make grand lines in many places where only ordinary evergreens are now to be seen.

Among evergreen flowering shrubs, none is more beautiful for this purpose than *Kalmia latifolia*, if allowed to grow its own way. *Berberis darwini* is another beautiful plant for a hedge where there is space. Such hedges are not desirable in all directions about a garden, but there are plenty of places where one or more of them might be used with advantage.—J. C. C., in *The Garden*.





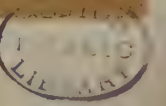




Residence of JULIUS H. APPLETON, Springfield, Mass.



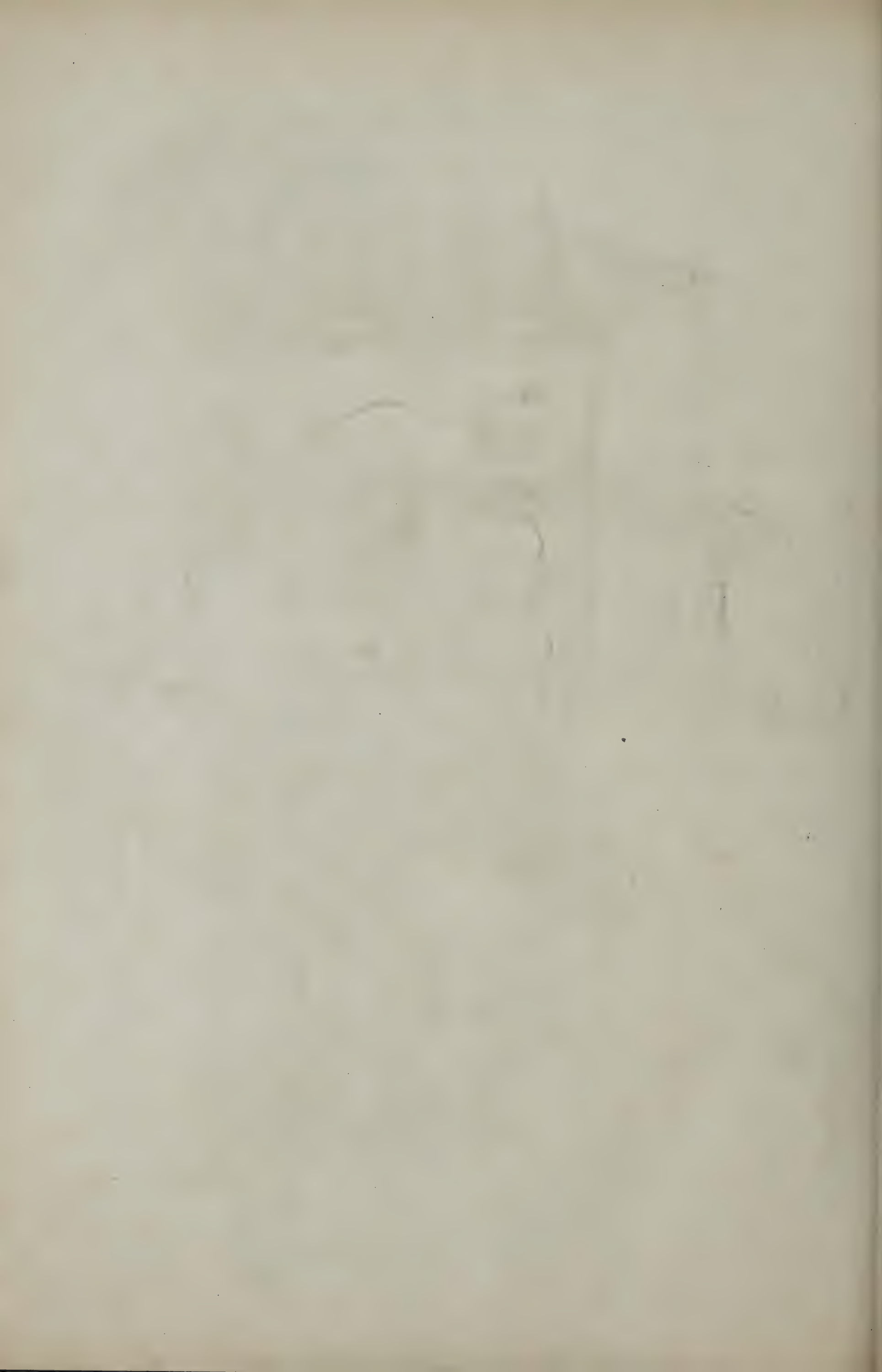
Residence of ANDREW L. FENNESSY, Springfield, Mass.













[GARDEN AND FOREST.]

## THE SQUARES OF PARIS.

One of the best features of the park system of Paris is the number of small squares scattered about in the different quarters of the city. The parks themselves, especially the larger ones, are at such great distances from the crowded centers of population that the working classes, except on Sundays and holidays, seldom have a chance to visit them, so that these squares admirably serve the purpose of keeping the children out of the streets and of allowing the poorer people, in the few hours of leisure they have during the week, to get a breath of fresh air and a glimpse of green.

A stranger, on first entering one of them, marvels as he sees how neatly they are kept while so thickly crowded with visitors, reading, working, or playing. In plan they are usually quite simple, as the accompanying diagram will show. A broad gravel walk, ten or twelve feet wide, following near but separated from the boundary by occasional shrubby plantations, incloses a quiet piece of lawn sufficiently open to get a glimpse through to the opposite end, but planted on the sides with trees, shrubs, and foliage plants.

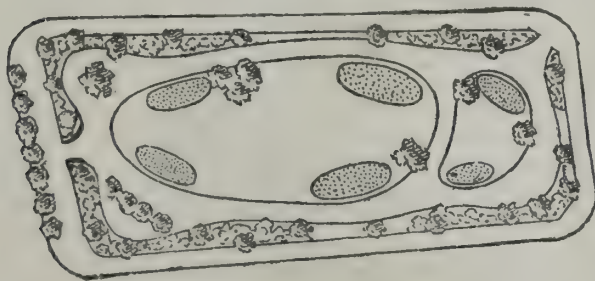
There are few attempts at fancy gardening, but much care has been taken to select hardy shrubs and plants, with the view of avoiding bare and empty beds during the winter. The condition of the turf is everywhere excellent, for water is freely used, and suitable small playgrounds are provided for the children, which serve the purpose of keeping them off the grass. These playgrounds, which are an admirable feature, are generally formed by simply widening the walks in the corners and planting enough trees there to afford ample shade. There are always one or two flower beds, which are kept bright and attractive during the spring and summer by a constant succession of showy flowering and foliage plants. Permanent seats are provided, but not in sufficient numbers to accommodate every one, but for a very small sum a chair for the whole morning or afternoon can be hired and you can move it about at will.

The only serious fault in all these squares is the stiff and formal appearance of the shrubberies. Almost without exception these plantations are in the form of regular figures—circles, ovals, or ellipses—and they are always planted on slight mounds. These two facts detract very much from any effect of naturalness, and it seems a great pity that, when it is so easy to give a varying outline to the groups, it has not been done. It would also be an improvement to plant the borders of these beds with plants or shrubs of low, half-trailing habit, and thus, in a measure, hide the sharp, stiff outline between the turf and the dug ground of the bed.

Of course, there are many variations from the typical plan. The Square des Batignolles contains about three acres and is one of the largest in Paris. It is situated on sloping ground, with an open lawn in the center, through which runs a small winding stream, which broadens out into an almost circular pond at the lower end. The course of this stream, in order to make a little variety, is occasionally interrupted by a group of rocks, which cause it to widen out into small pools, the margins of which are attractively planted with aquatic plants.

The Square des Arts-et-Metiers is on quite a different plan. Here a broad walk runs down the middle, giving a fine view of the building at the further end. It is surrounded by a handsome stone balustrade, and following this, on the inside, is a strip of turf and shrubbery about eight feet wide. All the rest of the surface, with the exception of two fountain basins, is of gravel, and is thoroughly shaded by eight rows of large horse chestnuts, whose branches touch each other, and thus form a very dense shade over the whole. Seats are provided here in plenty, and as it is one of the most crowded parts of the city, it is always full of people.

The Square du Temple is one of the prettiest of all



PLAN OF A PARIS SQUARE.

the Paris squares, or would be if the attempt had not been made to adorn it with statues. There are four of them here, and they detract much from the quiet and repose of the place. At the upper end there is a small cascade falling over artificial rockwork into a rather too formal pond. The trees in this square are exceptionally good.

These are a few of the more important squares, but by no means all, for in Paris there are no less than sev-

enty breathing places, not counting the boulevards and other tree-planted streets. They are usually most attractive spots, and teach a lesson which might very well be copied in many of the crowded cities of our country. Paris. HENRY S. CODMAN.

## THE HARTMAN INSIDE SLIDING WINDOW BLIND.

This very neat and useful device possesses some very decided points of merit in contrast with the old style inside blinds in common use. It can be easily attached

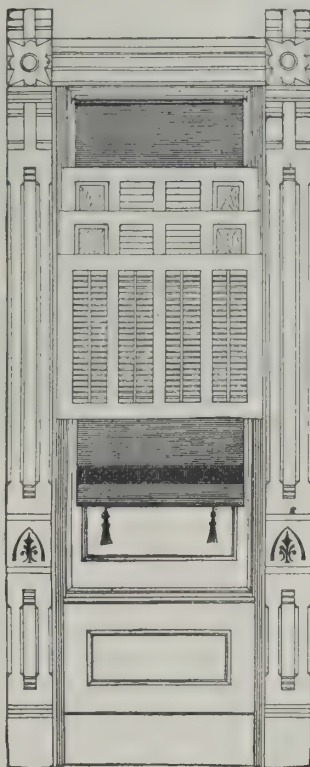


Fig. 1.

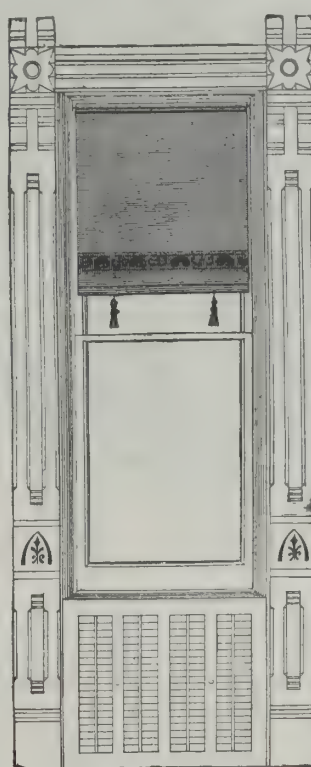


Fig. 2.

to the ordinary window frame and readily removed therefrom, the blind sliding and remaining in any desired position, being held in place by means of steel springs concealed from view. The blinds are made in three or more parts or sections, each moved independently of the other, and, according to the size of the window to be furnished, in two, three, or four panels in width. Figs. 1 and 2 show the blinds in place in a window in different positions, and their advantages over the old form of hinged blinds, in that they avoid unpleasant rattling and tangling with curtains, while they do not interfere with plants or flowers on the window sills. When the window frame admits of it, the blind guides are carried entirely down to the floor, as shown in Fig. 2, or stored in a pocket made for the purpose behind the panel back. Fig. 3 represents a section of a new style of these blinds, but lately introduced, in which the inside divisions of the sections are made to swing on hinges, so as to open and shut at pleasure, the springs showing to the right. The section slides up and down in connection with the other sections, of which it forms a part. To remove the blinds from the window frames, it is only necessary to press each section sideways against the springs, flattening them far enough to enable the stile on the other side of the section to pass out of the groove on that side, when the section is easily withdrawn. The makers supply each set of blinds complete, ready for insertion, and furnished with an automatic burglar-proof lock. An illustrated catalogue, with prices, may be obtained of the makers, Messrs. Hartman & Durstine, of Wooster, Ohio.

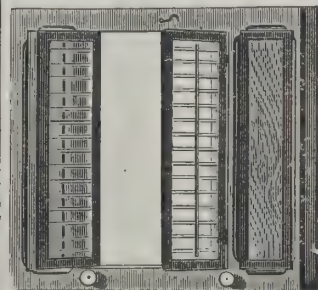


Fig. 3.

tions are made to swing on hinges, so as to open and shut at pleasure, the springs showing to the right. The section slides up and down in connection with the other sections, of which it forms a part. To remove the blinds from the window frames, it is only necessary to press each section sideways against the springs, flattening them far enough to enable the stile on the other side of the section to pass out of the groove on that side, when the section is easily withdrawn. The makers supply each set of blinds complete, ready for insertion, and furnished with an automatic burglar-proof lock. An illustrated catalogue, with prices, may be obtained of the makers, Messrs. Hartman & Durstine, of Wooster, Ohio.

## Electric Light Machines a Nuisance.

An interesting decision was recently handed down by Justice Morgan J. O'Brien, from the Supreme Court of this State, in the matter of an injunction asked for by Philip Braender, a New York builder. Complainant is the owner of a row of apartment houses on East 122d Street, which adjoin the station of the Harlem Electric Lighting Company, and he claimed that the machinery of defendant not only injured his buildings, but—because of the continued noise and constant jarring from its operation—he was also unable to keep the apartments tenanted. The evidence showed that the machinery or apparatus was constructed or operated in accordance with the best and most approved methods, and on this point the judge held that it was not *per se* a nuisance, hence special injury must be shown. In regard to the latter,

the judge admitted that the evidence on the second point—the disturbance and annoyance to the tenants, and the consequent loss to the landlord, because of the operation of the machinery—was all in favor of the plaintiff, and proved a case of substantial grievance. The injunction—with an extended time allowance for its initial effectiveness—was ordered, the extension being granted because it had been shown to the satisfaction of the judge that if the injunction were made operative at once, the lighting company's loss would be far greater than that which would *ad interim* be suffered by plaintiff. In other words, the company will be granted ample opportunity to relocate its plant.

## Defective Acoustics—A Troublesome "Echo."

The churchwardens of new St. Paul's church, Woodstock, Ontario, Canada, are desirous of corresponding with experts or others interested in such matters, with a view of removing the echo at present existing in their church. Correspondents will please state their experience and references. A considerable sum of money will be paid for the advice acted upon, if it is successful. Further information touching the subject upon application. The church is a Gothic building, 92 feet long, exclusive of semicircular chancel, which is 31 feet in diameter, making the extreme length of the church inside 107 feet 6 inches, by 63 feet in width. The nave is 37 feet wide, and the aisles are 13 feet wide. The columns supporting roof are of wood, and the church and chancel ceilings are all groined with wood, oiled and varnished. The chancel arch and other internal arches over columns supporting roof are constructed of wood and plastered. The height from floor of church to top of column is 20 feet; the height from abacus of column to apex of plaster arches supporting roof is 9 feet 6 inches. The height from floor of church to apex of groined ceiling is 52 feet. The space above apex of groined ceiling to apex of main roof is 15 feet. The basement is used only for heating purposes, and the church floor is not deafened in any way. The external walls are plastered on the brick, and there is no covering of any kind on top of ceiling boards. The church has no gallery.

The echo is evidently caused by the reverberations of the sound waves on the groined ceiling boards, it resembling the distant murmurings of the waves on the sea shore. When the church is filled with people, there is little echo. Some think the trouble is in the floor.

## STANLEY'S PATENT ROOFING BRACKET.

An article which affords a safe and speedy means of supporting stagings on a roof, and without the usual waste of lumber in constructing, or the leaving of nail holes when removed, would be considered a great boon to carpenters and painters.

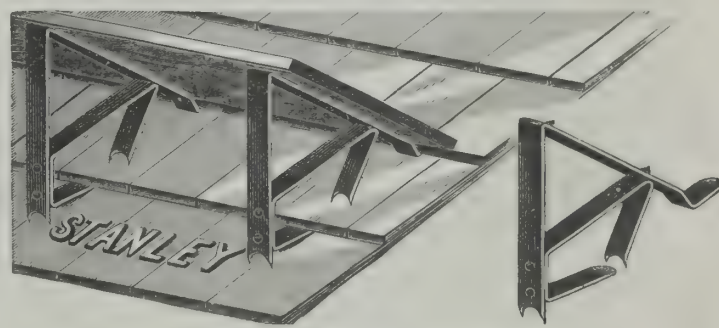
It is claimed that the article illustrated on this page meets just these requirements. Spring steel is used in its manufacture, and the peculiar form given to the bracket secures it in position, as the greater the weight on it, the stronger becomes its hold on the roof. Steel spurs also project above the horizontal surface to secure the staging boards in place.

To set the bracket: Grasp the back standard with the fingers through the center part, and spring the bow open enough for the front spurs to clear the shingle butt, then press the two beveled ends up under the shingles already laid until the front shoulder strikes the butt of the upper course.

To remove the bracket: Grasp with the fingers under the front of the bow, thus lifting the spurs until the bracket is released.

A dozen of these brackets can be set, or removed, in a minute; and, in constant use, they will last a lifetime.

The Stanley Rule and Level Company, of New



PATENT ROOFING BRACKET.

Britain, Conn., are the manufacturers, but they are sold by hardware dealers generally.

An English theater builder has contrived a lock in a panel occupying a large part of the inner surface of a door. Pressure on the inside unlocks and opens the door, but any one outside must use the key. This, if generally adopted, may save many lives. Terry's Theater in London, is equipped throughout with this lock.



## A NEW WOOD-WORKING MACHINE.

We illustrate herewith a new double cylinder planer and matcher, designed for general planing and matching in either hard or soft wood. It has many advantages for doing smooth and perfect work. It is adapted for doing custom work—general planing and smoothing, making flooring, ceiling, partition stuff, patent siding, casing, moulding, etc. It does a large range of work, planing 24 in wide both sides and up to 6 in. thick, and will match or edge up stuff 14 in. wide.

Both upper and lower cylinders are of steel, slotted on all four sides, so that all kinds of knives used in general planing mill work, such as beading, patent siding, and moulding bits can be placed on them in any position that may be desired. Both cylinders

are double belted and run in long self-oiling bearings. The lower cylinder is placed inside the last pair of feed rolls; this will be found a great advantage, as the work is fed entirely through the machine, dispensing with pulling out the last piece. The saddle or bearing for the top cutter head is fitted to very heavy planed housings and is adjusted from below the bed plate, giving free access to the cylinder in order to reset or sharpen the knives.

The side heads are of gun metal, and run on heavy steel spindles which are babbitted on strong yoke frames. They can be adjusted from the working side of the machine and so placed as to feed the flooring over any part of the table, insuring an equal wear on the bed. The side heads are fitted with a patent drop matcher attachment, by means of which they can be instantly dropped below the surface of the bed by a lever from the working end of the machine, in order to

roll is raised and lowered by a parallel shaft and hand wheel to operate the screws. The last pair of rolls feed the stock clear out of the machine. This will be found an advantageous arrangement, as very often the last piece is spoiled by pulling it out of the machine.

The patent pressure bars come close up to the knives on each side of the cylinder, insuring smooth work, as

are double seamed, are as tight as if made of lead when they are thoroughly cemented. It will be seen from the cut that the dust pipe is in the rear. This is an important point, for the dust escapes directly to the chimney, while in most other furnaces the dust flue is in front, and the dust passing into the heating chamber adheres to the inner surfaces and forms a scale which is injurious to their heating power.

The M. H. Jacobs Furnace Co., Syracuse, N. Y., manufacturers of this furnace, are giving guarantees for durability and heating power consistent with any reasonable circumstances. They desire the establishing of agencies all over the country and especially where economy in coal is an object.

The Sykes Iron Roofing Company, of Niles, Ohio, have recently issued a neat little

pamphlet explanatory of their patent improved metallic roofing, and the manner of putting it on, which it would be well for all intending purchasers of such goods to send for. The company uses a superior brand of iron, and has excellent facilities for supplying any demand on the most advantageous terms.

## AN IMPROVED SELF-DRAINING FLOOR FOR STALLS.

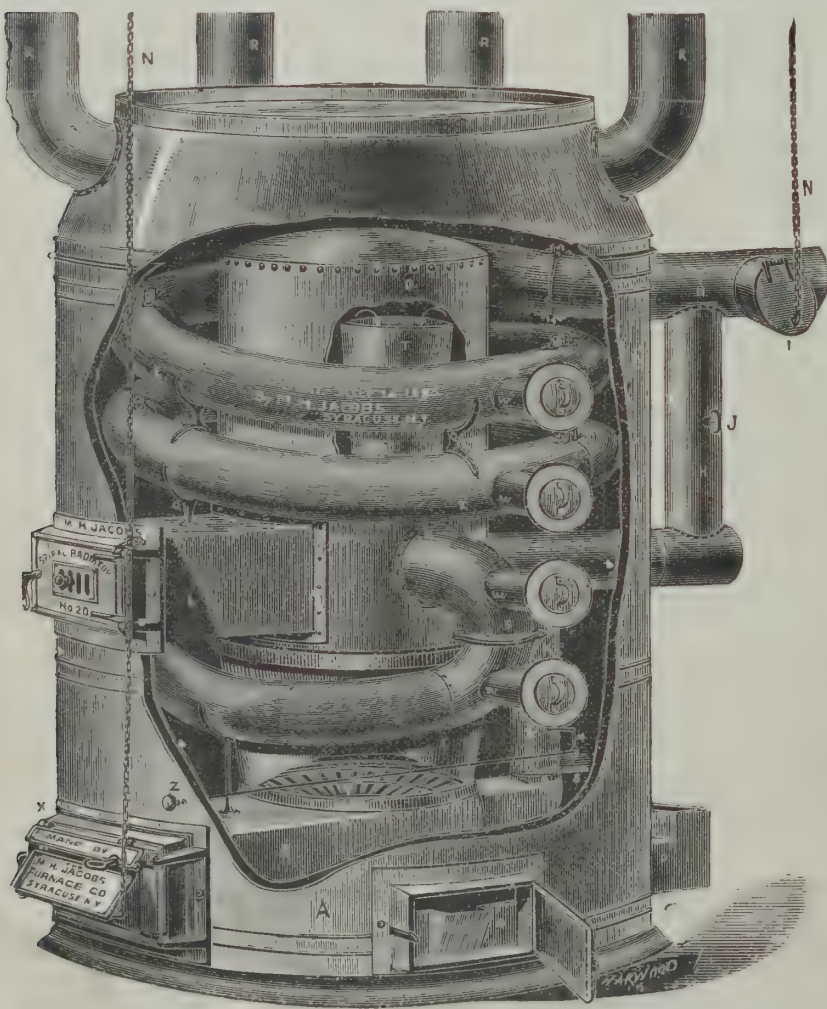
The stall flooring herewith illustrated, embracing a patented improvement of Mr. Martin Logan, of No. 64 East Seventy-seventh Street, New York City, is designed to be easily cleaned and not injurious to the feet of the stock. The floor of the stall is made with a flat central recess extending downward to the main floor of the stable and to the general drain, and in this recess is fitted a metal drain having longitudinal side flanges and spaced longitudinal ribs, the outer faces of which are shaped to form gutters, the other faces forming essentially dovetailed grooves. Wooden slats are adapted to the contour of the grooves, in which they are slid, and firmly yet detachably held. The entire drain can be easily lifted out from the stall, or the gutters can be readily kept clean when the drain is in position. The bed plate is of iron and the slats of hard oak. All clogging of the woodwork with manure, etc.,



LOGAN'S IMPROVED PATENT STALL FLOORING.

is avoided, as the channels between the slats act as independent gutters to carry off all refuse. No nails or screws to hurt the horse are used in this construction, and when the slats are worn they can be readily replaced without the aid of a carpenter.

If any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, containing full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.



THE M. H. JACOBS SPIRAL RADIATOR PORTABLE WARM AIR FURNACE.

surface the full width of 24 inches. A patent matcher clip, for breaking the chips, is attached to the heads and works on the same circle of the cutting edge, preventing all tearing out of chips or broken edges.

The feed is very powerful, and consists of four 6 in feed rolls strongly geared; the top rolls are driven with an improved expansion gearing and fitted with patent swiveling boxes, which allows the rolls to lift at either end without cramping or bending the raising screws; these swiveling boxes are connected to slides working on planed ways of the housings, and each

they prevent all chipping out; the means of adjusting them to or from the knives is simple and very convenient to the operator, and are made to accommodate any kind of bits. The bonnet, which is heavy, has an extension which comes down on the board being planed, holding it very solid as it is fed to the cutter head.

The beader is entirely independent, and can be instantly lifted out of the way.

For further information address the Egan Company, 209 to 229 West Front Street, Cincinnati, O., U. S. A.

## THE M. H. JACOBS PORTABLE WARM AIR FURNACE.

These furnaces, a view of which partly in section is shown in the accompanying illustration, are constructed differently from any other furnaces made, and have many points of superior merit. In providing room for the large spiral radiator it became necessary to make an unusually large furnace, so as to provide a larger

amount of radiating surface than other furnaces. These radiators are made of wrought steel, and coil of cast iron and wrought steel, and are adjusted to three classes of furnaces of five sizes each. The radiator being round and a perfect spiral free from angles, it cannot be clogged with ashes, for the reason that the force of the draught is even and strong in every part, drawing all dust or ashes into the chimney. They are easily cleaned of the little dust lodging in the under side of the tube by means of a round, stiff, woody fiber brush, having a solid wood center and wire leading and following attached, so when the smoke pipe is removed in spring for cleaning, the brush is entered in radiator and drawn through (by grasping the wire in the clean-outs) its entire length and then drawn back through again and out, thus touching and cleaning the interior of all dust. These furnaces will therefore heat a building with the same amount of coal the second or fifth years as was required the first; whereas some furnaces are so coated with layers of ashes that, instead of burning only eight tons, as was required to heat a house five years ago, they now require twelve tons to do the same heating.

Every angle in a furnace is a pocket for ashes, and will fill up, and, after midwinter, when check damper is raised, will leak gas. No such trouble can come from using the spiral radiator furnace.

These furnaces compel the products of combustion to travel further from the fire pot to the chimney than any other. Ascending to the top of the steel dome, they enter the interior shield, then pass down and out into the radiator, passing round and round until they reach the chimney, thus requiring less coal to heat a building. The wrought spiral radiator is made of No. 18 steel, which is annealed in oil when cooling, thus making it soft and refined, so that the joints, which



# F. W. DEVOE & CO.

(Established 1852)

## PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS**

**ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.**

Catalogues of our different departments to responsible parties.

Cor. Fulton and William Sts.,  
NEW YORK. Coffin, Devoe & Co.,  
176 Randolph St.,  
CHICAGO.



OUR STAINS are made from the best English Colors and pure Linseed oil with a small proportion of petroleum which serves to preserve the wood as well as the color. They do not contain any "gas oil" or "dead oil" which has the smell of Creosote, and we guarantee that all our samples have been dipped in our original stain. WE CLAIM superiority of color which will not wash off and will retain its brightness long after other stains have faded or turned black. Our Stain has been thoroughly tested by many of the leading Architects in this country during the past four or five years, and we have received many flattering testimonials. We will send a package of Stained Boards, by mail, to any address, on application. These small Sample Boards give but an imperfect idea however of the beauty of the Stain as the effect of Stained Shingles can only be seen in a mass on the house. ONE GALLON OF OUR STAIN will dip about 500 Shingles, or cover about 1500 shingles, when brushed on. Please note number on Sample Boards. We would advise Architects to specify as follows:

"DEXTER BROTHERS' ENGLISH SHINGLE STAIN."  
DEXTER BROTHERS, Sole Manufacturers,  
55 & 57 BROAD ST., BOSTON, MASS.

Send for copy of Memoranda of Specifications.

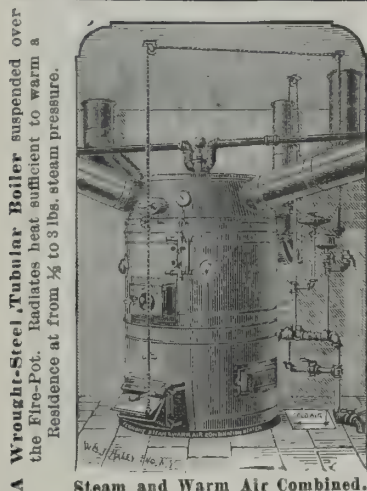
## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

MURPHY & COMPANY,  
227 BROADWAY,  
New York City.

## ECONOMY COMBINATION HEATER



The Original and Only Successful Combination Steam and Warm-Air Heater made.

**WEAK IMITATIONS**  
Attempted by Unprincipled Competitors testify to the merits of our Heaters.

Dealers and Users are Cautioned  
Against buying any apparatus infringing our patents.

MANUFACTURED SOLELY BY  
**J. F. Pease Furnace Co.**  
SYRACUSE, N. Y.

206 Water St., New York; 75 Union St., Boston; 177 Randolph St., Chicago; 153 Queen St., Toronto.

SEND FOR CATALOGUE  
Illustrating these Heaters, and also

## THE ECONOMY WARM AIR FURNACES.

## Architects, Builders, and House Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken, leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

GENERAL OFFICES:  
No. 708 PENN AVENUE, PITTSBURGH, PA.  
Branch Offices:  
Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
139 East Madison Street, Chicago. F. E. Dehenhardt, Manager.  
MANUFACTURERS OF

## The WARING ANTI-INDUCTION and BUNCHED CABLES, and ACHESON COMPOUND CABLE.

For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial.  
**Light Leaded Cables (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.**  
Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.  
All Work Guaranteed. Send for Illustrated Circular.

## GLASS.

**VANHORNE, GRIFFEN & CO.**  
131 to 137 Franklin Street,  
New York,  
—Importers of—

## French Window & Picture Glass

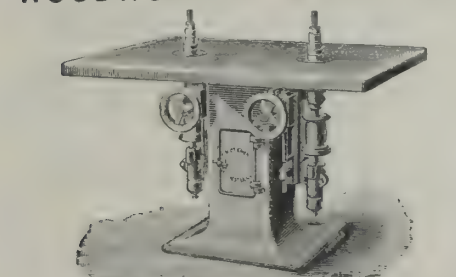
POLISHED AND ROUGH  
**PLATE GLASS**  
Ornamental Glass.

French and German Mirrors.

Manufacturers of  
**Bent and Beveled Glass**

**BENT GLASS WORKS,**  
NEWARK, N. J.

**Carpenters' and Builders' WOODWORKING MACHINES.**



Planers, Saws,  
Lathes, Shapers  
Combination  
Machines,  
Shafting, Pulleys  
ETC.

Entire Outfits.

**F. H. CLEMENT,**  
119 Mill St.,  
ROCHESTER, N. Y.

## THE LEIBRANDT & McDOWELL STOVE CO. PHILADELPHIA and BALTIMORE.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

It has all the new features combined in one range; namely, a hinged slip plate, allowing the whole surface of fire to be exposed for broiling; a lift-out bottom oven plate—an entirely new feature; the whole bottom of the oven lifts out, enabling the flues to be cleaned, as well as the bottom oven plate itself; it has a front feed door, making it unnecessary to remove covers to put on coal.

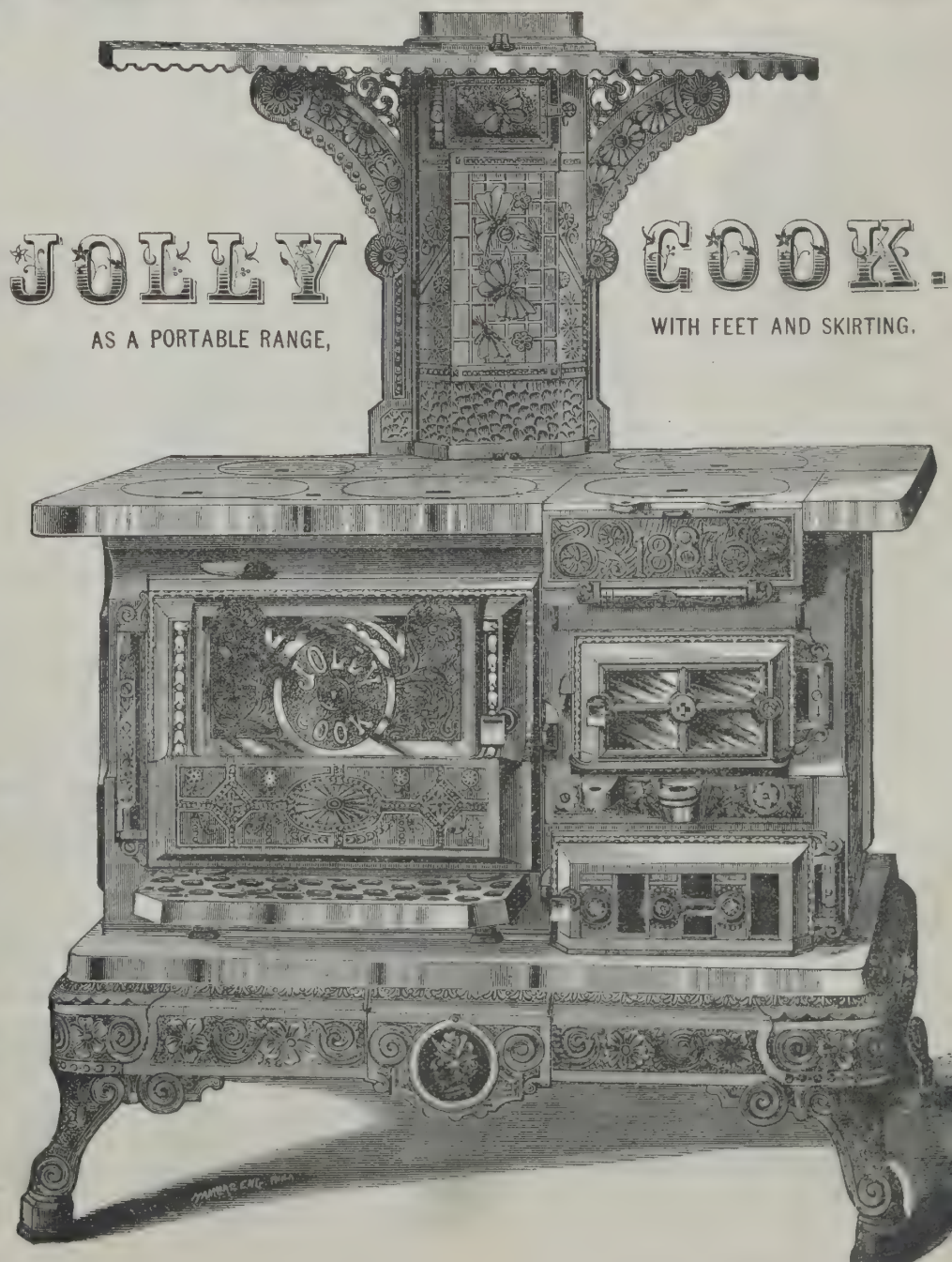
**As a Brick Set Range,**  
it requires no brick work except the jambs, all the flues being in the body of the range. Therefore it can be set by any bricklayer.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

We make these ranges either with the Draw-bar shaking grate, Duplex grate, or our Automatic grate, all being interchangeable.

The doors are all fitted with our patent hinge, which insures successful operation both in the oven and fire, the doors always fitting, allowing no escape of heat or gas.

Send for  
**HEATER and RANGE Catalogue.**





# MORSE ELEVATOR WORKS

MORSE, WILLIAMS & CO.  
Successors to CLEM & MORSE, Builders of all kinds of  
PASSENGER AND FREIGHT

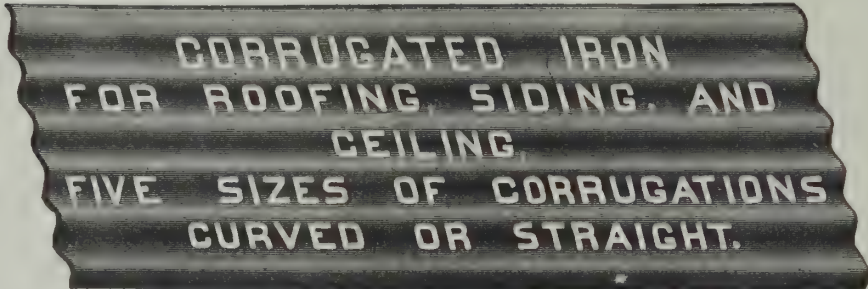


Automatic Hatch Doors  
A SPECIALTY.  
Send for Illustrated Circular.

Office, 411 CHERRY ST.  
Works, Frankford Av., Wilkey  
and Shoakamaxon Sts.,  
PHILADELPHIA.

N.Y. Office, 108 Liberty Street.

# THOMPSON MANUFACTURING CO., CLEVELAND, O.



We want to Mail you our New Illustrated Catalogue  
(84 pages), the Finest ever issued by a  
Roofing Company.

Iron and Steel Sheets are scarce and hard to get from the  
mills, hence our stock is much depleted, although we have  
ample contracts for supplies.

But we can still offer buyers the advantage of a well assorted  
stock of over 1,000 tons.

Give us a trial if you want prompt shipment.

THE CINCINNATI CORRUGATING CO.,

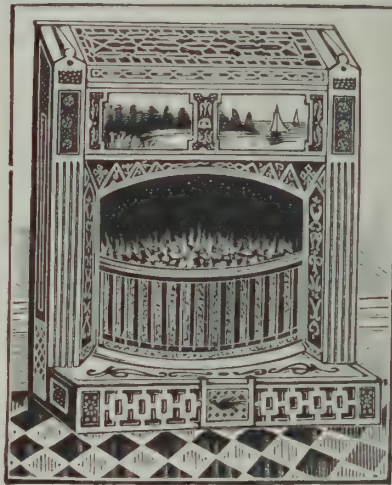
150 Eggleston Avenue,

Cincinnati, Ohio.



MANUFACTURED BY  
**CUSHMAN BROS. & CO.,**  
BOSTON, MASS.  
All Shades and Upholstery Goods at  
Bottom Prices.

# THE ALDINE FIREPLACE.



The Aldine is economical as well as sanitary in its  
results. It is the only grate that can be piped to com-  
mon chimneys, one or more rooms removed from the  
Grate itself, with as good results as if set in a chimney  
place. The Aldine secures perfect and slow combus-  
tion of fuel, warm floors, constant circulation of warm  
air, and perfect ventilation. The Aldine has the re-  
turn draught principal of a hard coal stove embodied  
in it, and compares with all other grates only as the  
modern return draught base-burning stove of to-day  
compares with the direct draught coal stove of 25 years  
ago. Send for illustrated circular. Address  
ALDINE MFG. CO., GRAND RAPIDS, MICH.

# MANAHAN'S PARCHMENT SHEATHING

Strongest, Lightest, most Waterproof.

One Dollar's worth covers more ground than same  
amount of most sheathing. Send for Samples.

HALLETT BROS., Sole Agents,  
290 Devonshire St., BOSTON.

# E. & H. T. ANTHONY & CO., 591 Broadway, N. Y.

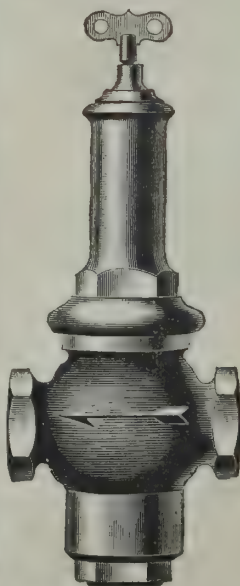
Manufacturers and Importers of

**PHOTOGRAPHIC  
INSTRUMENTS,  
Apparatus and Supplies,**

OF EVERY DESCRIPTION.

Sole Proprietors of the Patent  
Detective, Engraving, and  
Bicycle Cameras, and the Cele-  
brated Stanley Dry Plates.  
Amateur Outfits in great variety  
from \$9.00 upward. Send for  
Catalogue or call and examine.

More than Forty Years Estab-  
lished in this line of business.



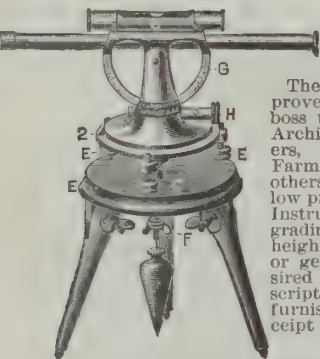
# OUR REDUCING VALVE

Is the standard used  
by the American and  
Southern Cotton Oil  
Companies and all the  
Sugar Refineries.

**MASON  
REGULATOR  
CO.,  
BOSTON.**

Steam Regulating  
Devices.

M. B. SWEZEY,  
MANUFACTURER OF  
Improved Dumb Waiters  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
CHICAGO, ILL.  
120 Twentieth Street,

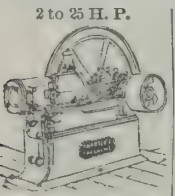


JOHN W. HARMON,  
65 Haverhill Street, Boston, Mass.



S. ADAMS & SONS,  
Patent Gang Lath Mill.  
Made of Iron and Steel. No. of  
saws 6; cuts 1 to 5 inch at will;  
saw lath and pickets at the same  
time if required; cuts 30,000 to 40-  
000 per 10 hours; cuts lath, pick-  
ets, broom handles, chair stuff,  
etc. Send for circular No. 22, giv-  
ing full information, and cash  
discounts. Price, with legs, \$125,  
without legs, \$115. S. Adams  
& Son, George St., Rome, N. Y.

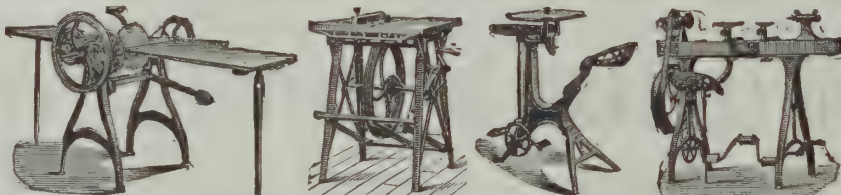
# CHARTER'S GAS ENGINE.



2 to 25 H. P.  
The Simplest, most Reliable, and  
Economical Gas Engine  
in existence.  
An impulse at every revolution.  
Perfect steadiness guaranteed  
for Arc or Incandescent Electric  
Lights.  
Independent of gas works when  
desired, and makes its own  
gas at a cost of 65 cents per  
H. feet, or about one cent per  
hour to each indicated H. P.  
A Perfectly Safe Motor  
for All Places and Purposes.  
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.

Williams & Orton Mfg. Co.  
P. O. Box 148. STERLING, ILL.

SEAMLESS  
BRASS &  
COPPER TUBES  
SHEET BRASS, BRASS WIRE  
Mention this paper.



# FOOT-POWER MACHINERY.

COMPLETE OUTFITS FOR CONTRACTORS AND BUILDERS.

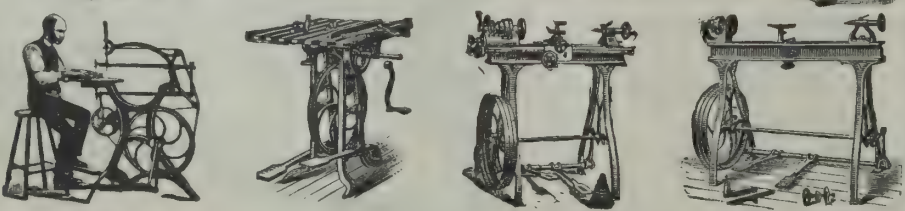
Machines for ripping, cross-cutting, scroll-sawing, mortising and  
tenoning, forming edges, grooving, gaining, rabbeting, cutting  
dados, and turning. Builders use our Hand Circular Rip Saw for  
the greater portion of their ripping in preference to carting their  
lumber to a mill five minute's drive from their shops. The same  
is true in regard to scroll sawing, mortising, tenoning, cutting stuff  
for drawers boxes, etc. Builders using these machines can bid  
lower and save more money from their contracts than by any  
other means.

Read the Following Letters from Builders:  
CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your  
Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the  
ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped  
as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs  
and sawed all drips for 200 windows."  
ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers  
to make for a drug store; the steam power mill wanted 50 cents each for making them.  
With my foot power machinery I made them, and saved \$25 above good wages on the job.  
If desired, these machines will be sold ON TRIAL.  
The purchaser can have ample time to test them in his own shop and on the work  
he wishes them to do. Descriptive Catalogue and Price List Free.  
W. F. & JOHN BARNES CO., No. 567 ... Ruby St., Rockford, Ill.

# CHAS. E. LITTLE, 59 FULTON ST. New York.

Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for  
**W. F. & J. Barnes' Workshop MACHINERY.**  
New York Agency. Factory Prices.

**Patent Foot Power Machinery.**  
The Latest and Most Improved, for  
**Carpenters, Builders, Cabinet Makers and  
Wood and Metal Workers Generally.**  
Machines for Scroll Sawing, Ripping, Cross-Cutting, Mit-  
ring, Rabbeting, Grooving, Gaining, Beading, Variety  
Moulding, Boring, Mortising, Tenoning, Wood and  
Metal Turning, Screw Cutting, Etc., Etc.  
Enterprising Mechanics are quick to see the Superior Merit of our Machines.  
Machines sold ON TRIAL if desired. Send for Catalogue and  
Price List, giving full description, testimonials, etc.  
**THE SENECA FALLS MFG. CO.,**  
276 WATER ST., SENECA FALLS, N. Y.





## OIL WELL SUPPLY CO., Limited.

PITTSBURGH, PA.,  
OIL CITY, PA., and  
BRADFORD, PA.

MANUFACTURE AND SELL ALL KINDS OF

## Tools and Machinery

BOILERS, ENGINES, TUBING, CASING and ROPE  
FOR

## Drilling, Equipping, and Pumping Artesian Wells,

And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,  
NATURAL GAS,  
WATER, or STEAM.



## MOORE'S

# AUGER BIT FILES.

ONE OF THE BEST "LITTLE" TOOLS EVER  
PLACED ON THE MARKET.



This is the only File ever invented that will file all sizes of Auger Bits without filing the screw  
and lip away, and spoiling the tool.

Price per dozen, \$1.40. Price each, postage paid, 15 cts.

WE ARE PARTICULARLY DESIROUS of introducing this File, as we are sure that there will be  
a large demand wherever it is once used. With this point in view we make the following

## SPECIAL OFFER.

On receipt of **TEN CENTS** we will forward to any address by mail one of these Files as a  
sample.

We will not send more than one file to any one address at this price.

This offer will only hold good on orders received by us not later than December 1, 1888.

Send 8 cents in stamps for our latest Catalogue No. 12 of Woodworkers' Tools, the most com-  
plete one ever issued; 200 pages, 700 illustrations.

**CHAS. A. STRELINGER & CO.,**  
DETROIT, MICH.

ESTABLISHED 1844.

**SAMUEL H. FRENCH & CO.,**  
York Avenue, Fourth and Callowhill Sts.,  
PHILADELPHIA, PA.

## PAINT MANUFACTURERS.

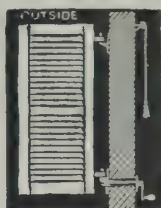
Strictly Pure Lead, Zinc and Colors, Dry, in Oil, Japan,  
and Ready Mixed for Use.

# PEERLESS MORTAR COLORS.

BLACK, BROWN, BUFF, AND RED.

Masons' and Builders' Supplies.  
SEND FOR CATALOGUE AND CIRCULARS.

## MALLORY'S STANDARD SHUTTER WORKER



Opens and closes the blinds without raising the window.  
Automatically locks the blinds in any position.  
Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

Can be applied to old or new houses, of brick, stone, or wood.

Send for Illustrated Circular and Testimonials.

If your Hardware dealer does not keep them send direct to

Frank B. Mallory, Flemington, New Jersey.

"THE WOMEN LIKE IT."

## GURNEY'S HOT-WATER HEATER.

413 EDMOND ST., ST. JOSEPH, MO.,  
June 5, 1888.

DEAR SIR:—The winter has been unusually  
severe, and at no time was there any trouble to  
heat the entire house to the desired temperature.  
Have had no doors to keep closed to stop that  
"cold draught." I like the heat and the working  
of the heater in every particular. Another and  
still greater is, the women like it. They can  
manage it and cannot say enough in its praise.  
If I built a house with but two rooms, and wanted  
them heated, would have the "Gurney."  
Yours respectfully,  
JOHN M. ARMSTRONG.

Illustrated Catalogue and Testimonial Sheet Free.

Gurney Hot Water Heater Co.

No. 237 Franklin St., Boston, Mass.

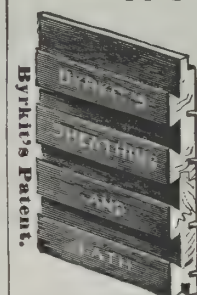
Selling Agencies:

New York, M. H. Johnson, 140 Centre St.  
Detroit, T. R. Chase, 31 Edmund Place.  
Portland, Or., W. Gardner & Co., 134 3d St.

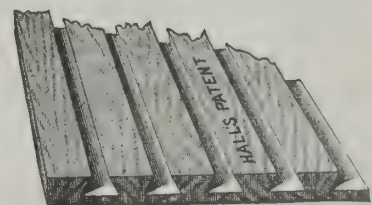
Chicago, Rice & Whitacre Mfg. Co., 42 & 44 W. Monroe St.  
Charleston, S. C., Valk & Murdock, 16, 18 & 20 Hasell St.  
Covington, Ky., J. L. Frisbie, 526 Philadelphia St.

MENTION THIS PAPER.

## HOW TO BUILD A PERFECT HOME WITH VERY LITTLE COST.



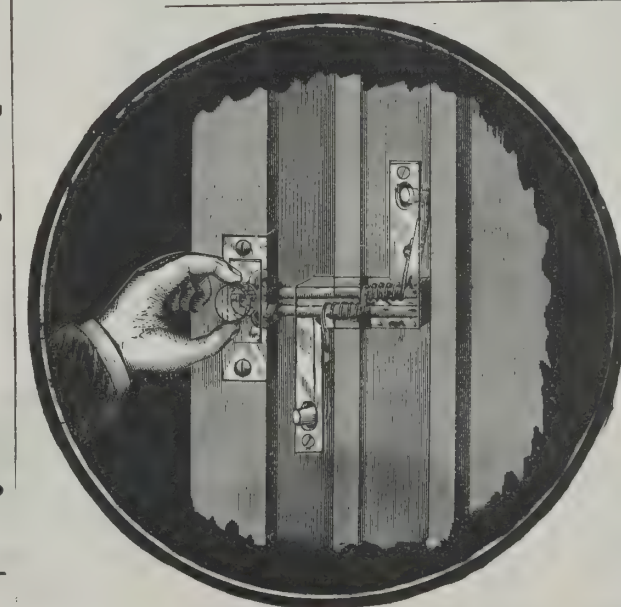
USE  
COMBINED  
SHEATHING  
LATH.



It makes a cheaper, warmer and stronger house than  
brick or stone. It is a dry and therefore a healthy house.  
The plaster will not crack. Architects and Builders  
specify it all over the country.

ADDRESS

**The Byrkit-Hall Sheathing Lath Co.,**  
226-228 LA SALLE STREET, Room 28, CHICAGO, ILL.  
For Eastern and New England States, address  
**I. C. JENKINS, OSWEGO, N. Y.**



—THE—  
**Timby Burglar-Proof  
SASH LOCK  
AND  
VENTILATOR.**

One Lock only required for a  
Window. It locks either or both  
sash securely in any position de-  
sired, thereby affording the  
means of Perfect Ventilation;  
also absolute security against  
Burglars and Sneak-Thieves.

Its simplicity, automatic ac-  
tion, strength, ventilating quali-  
ties, and adaptability to varying  
thicknesses of sash or inside  
stops, render it more desirable  
than any other Sash Lock now  
offered in the market.

Manufactured from the Best Malleable  
Iron, Steel, Brass and Bronze Metal.

**Jenkins & Timby,**  
Manufacturers.  
OSWEGO, N. Y.

## THORN SHINGLE & ORNAMENT CO.,

SOLE MANUFACTURERS OF

The Best and Cheapest Metallic Roofing

## TILES AND SHINGLES

YET OFFERED TO THE BUILDING TRADE.

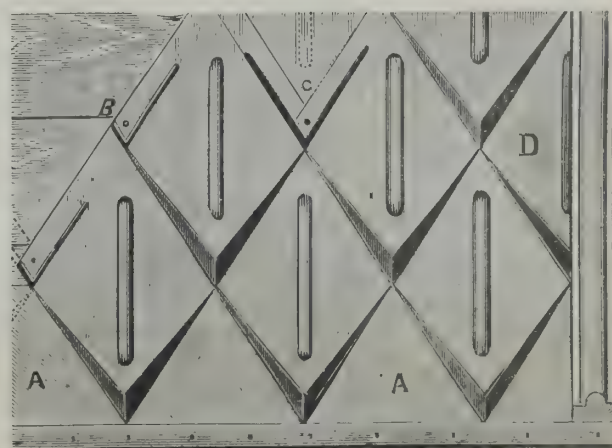
The Horseshoe Spring-Lock Shingle (Patten's Patent) just out. This Shingle can be put on in one-half the time it requires with  
any other shingle now in the market. Is cheap, durable, secure, thoroughly water-tight and makes a good appearance as a roof  
covering. Two (2) sizes.

THORN'S PATENT ROOFING and WALL TILES, the most perfect and Unique Roof, Gable, Tower, and Wall covering,  
cotta earthen tiles, and are better, and half the cost. Four (4) designs or sizes are made.  
All the above goods are packed a square to the box and delivered f. o. b. cars in Philadelphia.

For particulars, price lists, etc., address

**THORN SHINGLE & ORNAMENT CO.**

12th & Callowhill Streets, Philadelphia, Pa.





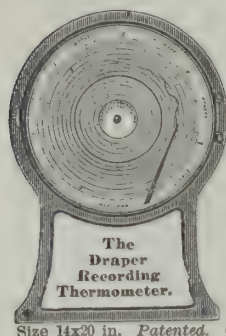
## THE PRENTICE METALLIC HIP SHINGLE

Patented Sept. 21, 1886.  
Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application.

**RETAIL PRICES.**  
Plain, for Shingle Roofs, - \$3.00 per Hundred.  
Painted, for Shingle Roofs, - 3.50 "  
Galvanized Iron, for Slate Roofs, - 7.00 "  
Copper, for Slate Roofs, - 22.00 "  
Liberal Discounts to Dealers and Contractors.

Orders promptly filled. Address, Box 184.  
METALLIC HIP SHINGLE CO., 516 to 520 Summit St., Toledo, O.

## The Draper Recording Thermometer.



This thermometer gives a permanent and continuous record in ink of the temperature. The chart indicating hours of the day and days of the week gives the degrees of temperature from 20° below zero to 110° above. All instruments are accurately adjusted and warranted. The record is easily read and absolutely correct. Sold by the leading instrument dealers and opticians throughout the United States and Canada, and by

**THE DRAPER MANUFACTURING CO.**  
Owners of the United States and foreign patents, 152 Front Street, New York

## L. MANASSE,

IMPORTER AND MANUFACTURER,

88 Madison Street, Chicago, Ill.



ARCHITECTS' AND SURVEYORS' SUPPLIES.

Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.

Improved LEVELS for Builders and Tiling.

Illustrated Catalogues Sent on Application.

JOHN WHEELER,  
CARPENTER and BUILDER

## ORNAIMENTAL RUSTIC WORK.

Medals from American Institute,  
And other Associations.  
P. O. Box 140. Cleveland St., Orange, N. J.



Anderson &amp; Dickey,

ARCHITECTURAL  
WOOD TURNING

—AND—  
Spiral Moulding,  
43 BRISTOL ST.  
BOSTON, MASS.

Stair Builders' Supplies  
BALUSTERS.

Newels solid or built up.  
Stair Rails of all dimensions  
worked ready to put up.  
Rope Moulding of all sizes,  
Mantels, Office Fittings, etc.  
Correspondence solicited.  
Send two-cent (2c.) stamp  
for illustrated catalogue.

THE  
Standard Wood Turning Co.58 BAY STREET,  
Jersey City, N. J.MACHINE-TURNED  
BALUSTERS

Various Sizes and Patterns Dove-  
tailed ready for use, with Tait's  
Patent Dovetail.

PEDESTAL and TURNED NEWELS.

STAIR RAILS,  
Of all dimensions, worked, ready  
to put up.

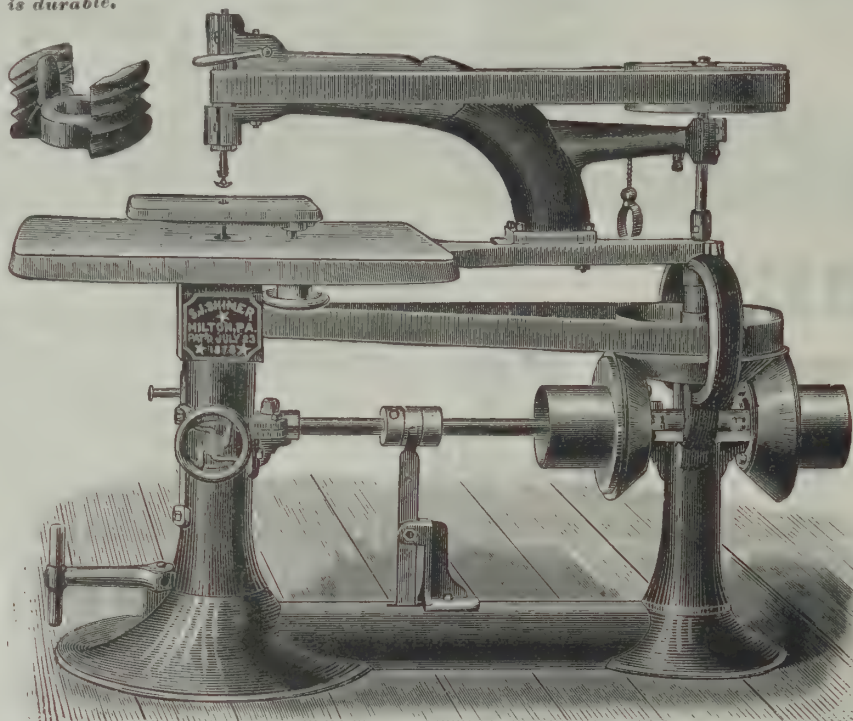
Send 4c. Stamp for our 32-page  
Catalogue, containing 200 Illustrations  
of Balusters, Pedestal Newels,  
Brackets, Drops, etc.

Shimer's Variety Moulder, with  
Surface Moulding Attachment.

**FOR SINKING** panels with pattern guided by pin that automatically takes its position when you start the Machine, and drops out of the way when you stop it. The Cutter in the overhanging arm of the Machine has a perpendicular adjustment of one inch, and is operated by the handle shown in the cut attached to an eccentric lever that is automatically locked to the one position when at work.

**TO CHANGE** from Surface Moulder to Variety Moulder, disconnect the rod that runs the incline on the T lever and pin it up. Run the housing up by means of the hand wheel until it stands above the belt line, remove the one spindle, substitute the other and set screw it to the housing. Turn the small table back under the arm. Raise the arm, disconnect the shaft that runs the upper pulley, and the Machine becomes an Edge Moulder without having any of its parts unbolted and laid away.

You never tire of the make up of this Machine, which is as simple and effective as it is durable.

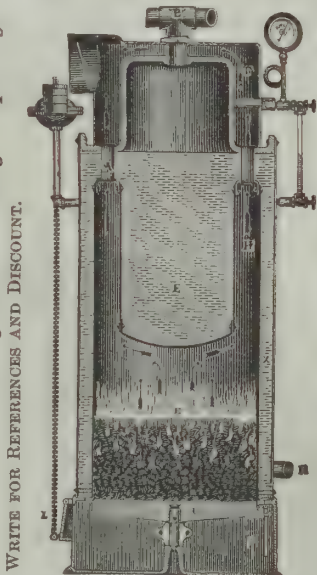


Reversible Cutters for any shape of mould made to order, and warranted to cut free and easy.  
For Circulars and full information, address,

SAMUEL J. SHIMER &amp; SONS,

MANUFACTURER of the SHIMER CUTTER HEADS and SPECIAL WOODWORKING MACHINERY,  
MILTON, PENN.

## Duplex Steam-Heater Co.

Manufacturers under FISKE'S PATENTS,  
10 Barclay Street, New York.Simplest in Construction.  
Largest Steaming Capacity.AGENTS WANTED EVERYWHERE.  
Send for Illustrated Catalogue and Price-List.THE "IDEAL"  
PATENT TILE-LINED BATH-TUB.

Perfection of Cleanliness and Durability.  
SHARPLESS & WATTS, Patentees,  
BAKER BUILDING,  
1524 CHESTNUT ST., PHILADELPHIA.  
Send for Illustrated Circular and References.

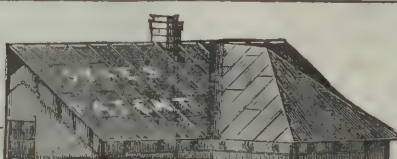
MAXWELL'S  
Gypsum Paint

For Whitening and Coloring Churches, Factories, Mills, Dwellings, Barns, Fences, or for any purpose where whitewash or kalsomine is used. Made in a variety of standard colors. Put up in 1/2 and one gallon, also 1/4, 1/8, and one barrel quantities.

A Beautiful, Durable, and Cheap article.  
Will stand any climate.  
MANUFACTURED BY  
JOHN MAXWELL,  
1603 OTSEGO STREET,  
PHILADELPHIA.

## SYKES' IMPROVED

Best Roof in the World.  
Suitable for all classes of Buildings. Easy put on.



SYKES IRON ROOFING CO., NILES, O.

Send for Circular and Price List, and mention this Paper.

All my Iron is Re-Rolled and Box Annealed, well Painted on both sides with Best of Paint and Pure Linseed Oil.

## WOOD FLOORS

BOUGHTON and TERWILLIGER  
233 STREET UNDER FIFTH AVE. HOTEL

ROOM 217, STEWART BUILDING, NEW YORK CITY

C. POWELL KARR, C.E.,  
CONSULTING ARCHITECT,

For Acoustic Work and all matters relating to Architectural Engineering.

ESTIMATES prepared from Building Plans and Specifications furnished by Architects, Owners, Builders, or Contractors for work to be done, and material supplied in the EASTERN or MIDDLE STATES. Terms upon application.

## ARCHITECTURAL PERSPECTIVES.

Architects and Builders who have plans which they desire to have put into perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

MUNN &amp; CO., Scientific American Office, 361 Broadway, New York.

## LEVELING INSTRUMENT.



**C. F. RICHARDSON,**  
ATHOL, MASS.,  
Manufacturer of Metal Levels.

## No. 11 PLANER &amp; MATCHER

Double Belted and Geared Lower Rolls.  
Special Machinery for Car Work and the latest improved Woodworking Machinery of all kinds.  
**C. B. ROGERS & CO.**  
Norwich, Conn.  
109 Liberty Street, New York.

## TO ARCHITECTS.

THE undersigned has had much experience in the making of perspectives from plans and elevations, and will promptly execute any orders, either in ink or colors as desired.

**A. F. LEIGHT,**  
361 Broadway, New York.  
TERMS MODERATE.

ESTABLISHED 1843.

Manufacturers of

## Stable Fittings and Fixtures,

IMPROVED and PATENTED.

IRON, BRASS, BRONZED and NICKEL-PLATED

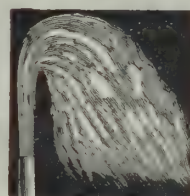
POULTRY YARD APPLIANCES, ETC.

Low estimates furnished to Architects, Builders,  
Carpenters, Masons, etc.

Catalogue Mailed on Application.

SAMUEL L. BENT &amp; SON,

No. 111 Chambers St., New York City.



## ARTESIAN

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue. **Pierce Artesian and Oil Well Supply Co.,** 80 Beaver Street, New York.

## LEFFEL'S HOUSE PLANS.

CONTAINING  
Elevations, Plans and  
Descriptions of Houses

costing from \$500 to \$3,000, and adapted to families having good taste and moderate means. Including the six prize plans in the *Mechanical News* competition. One oblong quarto, \$2.00.

Sent by mail, postage prepaid, on receipt of the price. Address

MUNN & CO., Publishers of Scientific American,  
361 Broadway, New York.



## Instantaneous Water Heater Co.

Manufacturers of the  
DOUGLASS PATENT  
Instantaneous Water Heater,  
FOR  
Baths and Domestic Purposes.

Can be used any place where gas and water can be obtained.  
**210 Illinois St., Chicago.**



THE LATEST & BEST IMPROVED  
**BRICK MACHINES**  
FOR BOTH STEAM  
AND HORSE POWER.

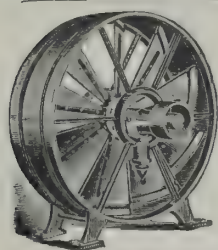


STEAM POWER BRICK MACHINE WITHOUT GEARS. STEAM POWER BRICK MACHINE READY FOR PULLEY.



SEND FOR ILLUSTRATED CATALOGUE  
**HENRY MARTIN,**  
INVENTOR, PROPRIETOR,  
AND MANUFACTURER.  
139 CHESTNUT ST.  
LANCASTER, PA., U.S.A.

HORSE POWER BRICK MACHINE.



**Clark's New Drying Exhaust and Ventilating Fans.**  
**PATENT ADJUSTABLE WINGS.**  
Capacity Quickly Increased or Diminished.  
**Self-Oiling Bearings. Light Running.**  
**Durable.**  
PRICE LIST FREE.  
GEO. P. CLARK, (Box A), Windsor Locks, Ct.  
JAMES GOLDSMITH, New York Agent, 744 BROADWAY.

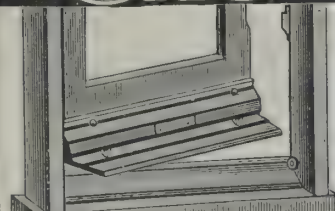
**PASSENGER ELEVATORS,**  
MANUFACTURED BY  
**HOWARD IRON WORKS,**  
BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

**GRAVES' ELEVATORS,**  
**PASSENGER and FREIGHT,**

MANUFACTURED BY  
**L. S. GRAVES & SON, Rochester, N. Y.**  
BRANCH OFFICE: 46 Cortlandt Street, New York.

**RICHMOND WEATHER STRIP CO.**  
MANUFACTURERS OF  
**ROWLETT'S INDEPENDENT**  
**AUTOMATIC COUNTER-BALANCED**  
**WEATHER STRIP.**



AWARDED BRONZE MEDAL AT CINCINNATI INDUSTRIAL EXPOSITION 1884.  
HAS NO SPRINGS, TRIGGERS OR CIRCLE IRONS; POSITIVE ACTION; CANNOT GET OUT OF ORDER; FITS ANY DOOR.  
AGENTS WANTED IN EVERY CITY AND TOWN IN THE U.S. SEND FOR CIRCULAR. SAMPLE STRIP, PREPAID TO ANY PERSON ON RECEIPT OF \$1.00. ADDRESS  
**RICHMOND WEATHER STRIP CO. RICHMOND, IND.**  
P.O. Box 282. FACTORY 217 N. 6TH STREET.  
MENTION THIS PAPER.

THE  
**WELLS PROCESS**  
Rustless Oxide of Iron.  
The Newest and Best Process  
FOR  
**PROTECTING IRON.**  
Special and Exclusive Rights for Sale

**RUSTLESS IRON WATER PIPE**  
SEND FOR CATALOGUE  
**THE WELLS RUSTLESS IRON CO.**  
211 CLIFF STREET NEW YORK



**Mineral Wool**  
FOR  
FIRE-PROOFING,  
DEADENING SOUND,  
and INSULATION of HEAT  
and COLD in  
RESIDENCES,  
COLD STORAGE, and  
REFRIGERATING ROOMS.  
Descriptive Pamphlet and  
Sample Free.  
**ADDRESS:**  
**Western Mineral Wool Co.,**  
Cleveland, O.  
St. Louis, Mo.

**ICE and REFRIGERATING MACHINES**  
The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

To Architects,  
Builders,  
and Owners.

Attention is called to Fireproof and Vermin Proof  
**MINERAL WOOL**  
As a Lining in Walls and Floors for preventing the  
Escape of Warmth and the Deadenng of Sound.  
Sample and Circular Free.  
U. S. Mineral Wool Co., 2 Cortlandt Street, N. Y.

**IMPORTANT**  
To Architects, Builders, House-Painters, Decorators, Boat-Builders  
and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Varnishes or Wood-Finishes in the market, for the following reasons, viz:  
They possess more body, higher luster, greater resisting properties to atmospheric influences, action of water and alkali, are more elastic, will not scratch or mar white, and are more durable.



For all classes  
Inside Work,  
Requiring great durability, use No. 2 ELASTICA FINISH.  
For  
Outside Work,  
Requiring extreme durability, use No. 1 ELASTICA FINISH.

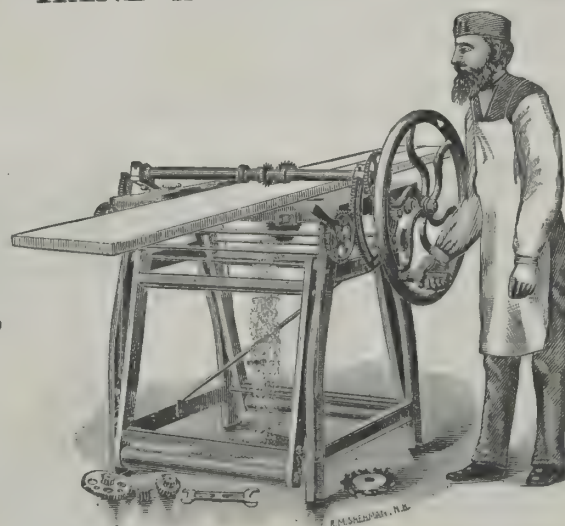
WORKS:  
734-740 East 14th Street,  
733-739 East 13th Street,  
199-207 Avenue D.

Manufactured by  
**STANDARD VARNISH WORKS,**

**D. ROSENBERG & SONS,**  
Office, 207 Avenue D,  
Send for Samples and Full Particulars.  
**NEW YORK.**

**CARPENTERS' MACHINERY,**  
HAND AND FOOT POWER.

Lathes,  
Tenoners,  
Mortisers,  
Scroll Saws,  
Groovers,  
Formers.



Rip Saws,  
Cross Cut Saws,  
Combined Saws,  
Jig Saws,  
Edge Moulders,  
Dado Heads.

FRED. A. RICH, 25 South Canal Street, CHICAGO.

**HEMACITE.**  
Easily the Best and  
Handsomest  
Interior Door-Handle  
Address  
**DIBBLE MFG. CO.,**  
Trenton, N. J.





## The Great Architect.

H. H. RICHARDSON  
AND HIS WORKS.

By Mrs. SCHUYLER VAN RENSSELAER.  
With a fine portrait of Mr. Richardson, twenty-six full-page Heliotypes, and over seventy other sketches, full-page and smaller, illustrating Mr. Richardson's works. *The edition is limited to 500 copies.* In a quarto volume, attractively bound. \$20.00.

Mrs. Schuyler Van Rensselaer's great monograph, *Henry Hobson Richardson and His Works*, is one of the most beautiful art books ever attempted in this country, and has the special merit of being American in spirit and substance, in matter and manner, in its genius and in workmanship. In form it is a folio, the page being twelve inches wide by fifteen in height. There are ix and 152 pages of text, thirty-seven full-page illustrations, and nearly double that number in the text. Almost all the full-page illustrations are beautiful heliotypes, making a really splendid gallery of Mr. Richardson's principal works. Whether it would have been possible to find a better biographer for Mr. Richardson than Mrs. Van Rensselaer it is not easy to determine. It is manifest, however, that her work is adequate and satisfying—an extraordinary achievement, which will add to Mrs. Van Rensselaer's fame and give great pleasure to Mr. Richardson's admirers in the profession.—*Boston Beacon*.

## Building and Buildings.

**BUILDING CONTRACTS, LEASES, EASEMENTS, AND LIENS.** By A. PARLETT LLOYD, Esq., of the Baltimore bar, author of "The Law of Divorce." 1 vol. 8vo, cloth, \$4.50; law sheep, \$5.00.

This is the first adequate American treatise ever published on the Law of Building. Mr. Lloyd has made a careful and exhaustive study of the subject, and his work contains reference to and citations from every important English and American case upon matters relating to building. It is a plain, clear statement of the law as enacted by legislation and decided by the courts, and is a work of great value to builders.

\*For sale by all Booksellers. Sent by mail, postpaid, on receipt of price by the Publishers.

**HOUGHTON, MIFFLIN & CO., Boston,**  
11 East Seventeenth Street, New York.

Send 25 cents for a copy of our new book, entitled  
"HOW BEST TO LIGHT OUR COUNTRY HOMES AND RESORTS."

Some practical suggestions, emphasized by illustrations of a few that are so lighted.

GILBERT & BARKER MFG. CO., 75 Maiden Lane, New York.

## PLANS and SPECIFICATIONS.

Full plans, specifications, and sheets of details, complete, ready for the builder, may be obtained at this office, for any of the structures illustrated in this publication. We also prepare plans for buildings of every description, including churches, colleges, schools, stores, dwellings, carriage houses, barns, etc. We are assisted in this work by able architects, and we try to make our estimates reliable, so that the work can be done by any reliable builder at the prices named. Terms moderate.

MUNN & CO., 361 BROADWAY, NEW YORK.

## SEBASTIAN, MAY &amp; CO.,

Manufacturers of and Dealers in

Hand and Foot Power Machinery  
For CARPENTERS, BUILDERS, MACHINISTS, etc.

183 W. Second St., Cincinnati, O.

E. J. JOHNSON,  
SLATE BLACKBOARDS,  
— ROOFING SLATE.

SLATE ROOFERS' SUPPLIES.

HEARTHES, SILLS, LINTELS, STEPS, MANTELS.

Special orders will receive prompt attention. Send for estimates.

Quarry: Bangor, Pa.

Office: 18 Burling Slip, New York.

Send for descriptive circular of Indestructive Slate Roof for Flat Roofs only.



## The Old Bangor Slate Company

F. C. YARNALL, President,  
PHILADELPHIA.

J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawed Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.

OCTOBER, 1888.

## NEW BOOKS.—Now Ready

**Rocks and Soils:** Their Origin, Composition, and Characteristics; Chemical, Geological, and Agricultural. By Horace Edward Stockbridge, Ph.D., Professor of Chemistry and Geology in the Imperial College of Agriculture, Sapporo, Japan. Chemist to the Hokkaido Cho. With 13 full-page plates. 8vo, cloth. \$2.50.

**Stair-Building:** In its various forms and the One Plane Method of *Hand Railing* as applied to drawing Face Moulds, unfolding the center line of Wreaths, giving lengths of Balusters under all Wreaths. Numerous designs of Stairs, Newels, and Balusters—for the use of Architects, Stair Builders and Carpenters. By James H. Monckton. Illustrated by 81 full-page plates of working drawings, etc. Second Edition. With 16 additional full-page plates (97 in all). 4to. \$6.00.

"It may certainly be considered the champion work of its kind, and not only stair builders, but architects, owe you a debt of gratitude for making their labors lighter in this regard."—O. P. HARTFIELD, Architect.

**Elements of Analytical Mechanics.** By Col. Peter S. Michie, of U. S. Military Academy. 1887. Complete, including Fluids. 8vo, cloth. \$4.00.

## Recent Publications.

**Photography Applied to Surveying.** By Henry A. Reed, U. S. Army, author of "Topographical Drawing and Sketching." With many illustrations. 4to, cloth. \$2.50.

"Lt. Reed's volume is the best work we know of in the English language."—*Photographic Bulletin*.

**Practical Hints for Draughtsmen.** By Prof. Chas. W. MacCord, Stevens Institute of Technology. 4to, cloth. \$2.50.

"The book is profusely illustrated and, in every respect, deserves to be strongly commended to students of mechanical drawing."—*Mechanical News*.

**A Manual of Steam Boilers, Their Design, Construction, and Operation.** For Technical Schools and Engineers. By Prof. R. H. Thurston. Many illustrations. 8vo, cloth. \$6.00.

"Probably one of the most complete works on Steam Boilers that has ever been issued."—*Manufacturers' Record*.

**Notes on the Compressive Resistance of Freestone, Brick Piers, Hydraulic Cements, Mortars, and Concretes.** By Q. A. Gillmore, Ph.D., author of "Treatise on Limes, Cements, Mortars, etc." 8vo, cloth. \$3.50.

"The work should be in the hands of every mechanic who has to do with the construction of walls. To the Architect and Designer it is simply indispensable."—*Manufacturers' Gazette*.

**The Design and Construction of Masonry Dams.** Giving the method employed in determining the profile of the Quaker Bridge Dam. By E. Wegmann, Jr., C.E., Division Engineer New Croton Aqueduct. Illustrated by types showing the High Masonry Dams of the World. Containing 58 plates showing some Dams. 4to, cloth. \$5.00.

"As a summary of the best and latest results of engineering skill in the construction of masonry dams, this volume will prove of extreme value to engineers whose work or studies lie in that direction."—*Railway Age*.

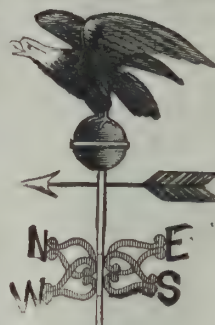
**JOHN WILEY & SONS,**  
Astor Place, New York.

Catalogues and Descriptive Circulars free by mail.

## Superior Copper Weather Vanes

GILDED WITH PURE GOLD.

TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.



Vanes made from any Drawing or Design on Short Notice.

**T. W. JONES,**

SUCCESSOR TO

**CHAS. C. BRIGGS,**

**V. W. BALDWIN,**

Removed from 213 Pearl

Street to

**170 & 172 Front St.,**

Near Maiden Lane,

**NEW YORK.**

Illustrated catalogue of over 250 designs, mailed to any address on receipt of a two cent stamp, half the postage.

## Notes and Queries.

(1) T. E. & S. ask: What is the proper speed for a sixty inch circular saw to cut 15,000 feet of lumber per ten hours? A. The saw should have a speed of 600 revolutions per minute, for best effect. It should easily cut 15,000 feet of lumber in ten hours with twenty horse power.

(2) A. E. S. asks: Which possesses the greater strength when placed horizontal, standing on highest edge—a piece of timber 40 feet long, 12 x 18 inches, or piece same length, but 14 x 16 inches? A. The 12 x 18 inches is the strongest, its moment of inertia being 5,882, while the moment of inertia of the 14 x 16 beam is only 4,778, and their safe load at center 6,026 pounds and 5,555 pounds.

(3) L. R. D. — Lightning rods well grounded are a protection. Ground bone is applied directly to the soil, being sown broadcast like grass seed. 500 to 1,000 lb. per acre may be used. Sometimes it is mixed with wood ashes, 15 to 30 bushels of the latter being applied per acre.

(4) C. W. B. asks the quickest and cheapest way of putting a fine polish on light colored woods, such as white holly, etc. A. Rub paraffine on and polish with a white woolen cloth. Mastic varnish is suitable for white holly. Also, bleached shellac makes a good varnish, using 95 per cent alcohol for solution.

(5) H. W. S., Jr., writes: I have a cistern from which a lead pipe connects with a pump in the kitchen. The water is of a yellowish cast and very foul. The water drawn from the neck of the cistern with a bucket is of good taste and void of odor. Can you give me a remedy? A. The surface water of your cistern is purified by absorption of air. There is no circulation by which the water at the bottom is brought to the surface. The oxygen or air that is carried into the cistern, combined with the water, is soon absorbed in oxidizing the vegetable and other matter in the water. When no more oxygen is available a putrid decomposition sets in, which is the trouble that you complain of. The only remedy is thorough and often cleaning of the cistern, or forcing air down to the bottom, allowing it to bubble up through the water. A small force pump will answer the purpose. A bag of charcoal pushed down to the bottom, and held there, may improve the water.

(6) C. S. A. writes: What kind of a wash can I use to remove tobacco stains from new pine floors? I have just finished a new house, and the mechanics have left tobacco stains upon the floors, which sal soda and hot water does not entirely remove. A. Take one part calcined soda and allow it to stand 3/4 hour in 1 part slaked lime, then add 15 parts water and boil. Spread the solution thus obtained upon the floor with a rag, and after drying rub with hard brush and fine sand and water. A solution of 1 part concentrated sulphuric acid and 8 parts water will enliven the wood after above application. When dry, wash and wax the floor.

## THE TIFFANY

## GLASS COMPANY

MEMORIAL WINDOWS

GLASS WORK DECORATIONS

Designs and Estimates submitted.

333-335 Fourth Ave., New York City.

## NEW BOOKS!

FROM THE PRESS OF

## J. B. Lippincott Company.

—O—

## CHAMBERS'S ENCYCLOPEDIA. Vol. II.

A Dictionary of Universal Knowledge. Edited and Published under the auspices of W. & H. CHAMBERS, Edinburgh, and J. B. LIPPINCOTT COMPANY, Philadelphia. *Entirely Revised and Rewritten.* Complete in ten volumes. Vol. I. issued March 1. To be issued at intervals. Price per vol., Cloth, \$3.00. Cloth, uncut, \$3.00. Sheep, \$4.00. Half Morocco, \$4.50.

The same thorough revision and accuracy that characterize the first volume are also found in the second. It contains 828 pages, from Bea to Cata, is profusely illustrated with new wood-cuts, and supplied with maps of Belgium, Burma, California, Dominion of Canada, Eastern Provinces of Canada, Cape Colony, and South Africa. "Altogether it is an accurate, concise, and scholarly compendium of useful knowledge, a rich treasure at a low price."

## OPINIONS OF THE PRESS.

"One of the most valuable works of reference in existence."—*New York World*.

"No book of the size gives more information, or gives it, on the whole, with greater accuracy."—*St. James Gazette, London*.

"No book besides the Bible and the handy dictionary can be said to be more important."—*Boston Herald*.

"Could we own but one Encyclopædia, Chambers's would be that one."—*Boston Advertiser*.

"The new Encyclopædia will be a library in itself, and will be certain to be highly appreciated wherever the English language is spoken."—*Liverpool Mercury*.

—O—

## THE CHEMICAL ANALYSIS OF IRON.

A complete Account of all the Best-Known Methods for the Analysis of Iron, Steel, Pig-Iron, Iron Ore, Limestone, Slag, Clay, Sand, Coal, Coke, Furnace and Producer Gases. By ANDREW ALEXANDER BLAIR, Chief Chemist United States Board, Appointed to Test Iron, Steel, and Other Metals, 1875; Chief Chemist United States Geological Survey and Tenth Census, 1880. Octavo. Handsomely Illustrated. Extra Cloth. \$4.00.

"It is a hand-book which will be found invaluable by the metallist, and may be considered the best book of the sort in the market."—*Boston Courier*.

"A technical work that has cost a good deal of study, and it ought to find ready sale among iron-masters and analytical chemists."—*The Wisconsin, Milwaukee*.

—O—

## HIGHWAYS AND HORSES.

By ATHOL MAUDSLEY. With numerous illustrations. One volume. 8vo. Bound in Cloth. \$5.50.

"Those who want a work of this kind will enjoy it very much indeed. Its miscellaneous material has interest for the reader who rarely frequents highways and who hates horses. It contains concise accounts of the history and origin of roads, and not the least attractive features are the abundance of admirable photo-engravings."—*Philadelphia Press*.

"There is a great deal of information in the book, and it contains many novel and striking facts."—*London Review*.

If not obtainable at your Booksellers', send direct to the Publishers, who will forward the books, post-paid, on receipt of the price.

**J. B. LIPPINCOTT CO., Publishers,**

715 and 717 Market St., Philadelphia.

## THE

## American Architect &amp; Building News

An illustrated weekly journal.

Yearly subscription to regular edition,	\$6.00
" " " " " " " " " " " "	7.00
" " " " " " " " " " " "	1.75
" " " " " " " " " " " "	10.00

Bound volumes (cloth), \$9.00, to \$10.50, according to date of issue.

**Fromentin's** (Eugène) *The Old Masters of Belgium and Holland.* 8vo. With eight full-page Heliotypes. Translated by Mrs. Mary C. Robbins. \$3.00.

**Fuller's** (Albert W.) *Artistic Homes in City and Country.* Fourth Edition. *Oblong folio.* 76 full-page illustrations. \$4.50.

**Gardner's** (E. C.) *Homes and all about them.* 3 vols. in 1. Profusely illustrated. 12mo. \$2.50.

**Clark's** (T. M.) *Building Superintendence.* 8vo. With Plans, etc. \$3.00.

**Hoyt's** (William E.) *Household Sanitation.* 16mo. 30c. Paper covers. 15c.

**Home Sanitation.** A Manual for Housekeepers. 1 vol. 16mo. 50c.

**Langley's** (Samuel Pierpont) *The New Astronomy.* Royal 8vo. Gilt top and rough edges. Richly illustrated. \$5.00.

**Morse Collection of Japanese Pottery** (The). By Sylvester Baxter. 4 full-page Heliotypes and numerous Vignettes. Folio, in paper covers. \$1.00.

**Morse's** (Edward S., Ph.D.) *Japanese Homes and Their Surroundings.* 8vo. With 300 illustrations. \$5.00. Half-calf, \$9.00. New Library edition, \$3.00. In half-calf, \$6.00.

**Picturesque Sketches.** Statues, Monuments, Fountains, Cathedrals, Towers, etc. 1 vol. oblong folio. \$1.50.

**Index** (Decennial) to Illustrations in the American Architect and Building News. 1876-85. 8vo. \$2.00.

**Ware's** (Professor William R.) *Modern Perspective.* A treatise upon the Principles and Practice of Plane and Cylindrical Perspective. 1 vol. 12mo. With Portfolio of 27 plates. \$5.00.

Sent, post-paid, on receipt of price.

**TICKNOR & CO.,**  
**BOSTON.**



## New Combination Dividers.

Forming Dividers with short and long extension points (pencil may be used in connection with either), Outside Calipers, Inside Calipers and Hermaphrodite Calipers.

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard tough, strong, and finely finished.

The joint is large and firm. The quadrant is round and fastened by an improved method. The steel points are tempered by a process which leaves them hard and tough. On the threaded end of the quadrant, between the adjustable legs, is a knurled nut, against the inside of which a helical spring acts. After the points are adjusted the nut may be turned back against the leg, **LOCKING IT FIRMLY.**

A common pencil fits either socketed leg, while an auxiliary holder is also furnished to fit reversed end of either point. This is one of the most useful combinations of the kind, as well as the **BEST MADE TOOL EVER PRODUCED.**

Send Stamp for Illustrated Price List of Fine Tools for Mechanics.

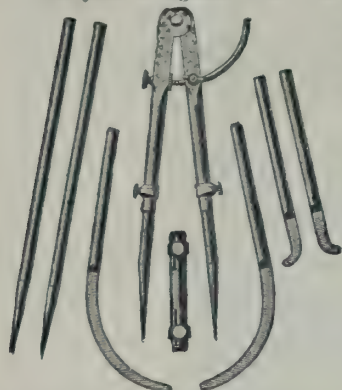
**L. S. STARRETT,**

MANUFACTURER OF

Combination Squares, Caliper Squares, Bevel Protractors, Thread Gauges, Steel Rules, Surface Gauges, Scratch Gauges, &c., &c.

Full Line of Calipers and Dividers, best on the market.

**ATHOL, MASS.**



STARRETT'S NEW COMBINATION DIVIDERS.



## Warren's Natural Asphalt Roofing.

Superior to all others for Flat Roofing.  
Over 20,000,000 square feet used within 10 years.

This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.

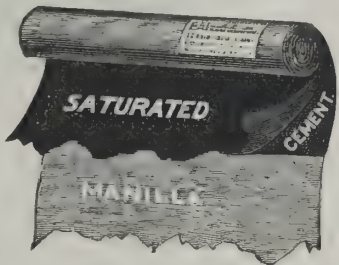
### "COMPOSITE" FELT.

For Roof Foundations.

A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is **absolutely impervious to moisture; for use under slate, shingles, etc.,** it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete water-proof covering.

Send for samples and Circular No. 2.

**WARREN CHEMICAL & MFG. CO. No. 114 John Street, New York.**



## GLASS

PHILLIPSEMMER GLASS CO. LTD.  
PLATE SHEET & LOOKING GLASS DEPOT  
No. 12 & 14 DESBROSSES ST. NEW YORK.  
WRITE FOR QUOTATIONS.

Franklin S. Carter    Chas. M. Wilkins    E. Ward Wilkins  
ESTABLISHED 1867

## PARTRICK & CARTER.

MANUFACTURERS OF AND DEALERS IN EVERY DESCRIPTION OF

# ELECTRICAL SUPPLIES

SOLE PROPRIETORS OF THE  
PATENT NEEDLE ANNUNCIATORS AND BURGLAR ALARMS  
WE MAKE A SPECIALTY OF  
BELLS, DISQUE LECLANCHE BATTERIES GAS-LIGHTING APPARATUS  
AND A FULL LINE OF  
SUPPLIES FOR ELECTRIC BELL WORK

WE PUBLISH CATALOGUES OF ALL OUR MANUFACTURES, AND WILL FORWARD TO ANY ADDRESS UPON APPLICATION.  
WHEN APPLYING FOR CATALOGUES PLEASE STATE WHETHER ELECTRIC BELL OR GENERAL ELECTRICAL SUPPLY CATALOGUE IS WANTED, AND IF IN THE TRADE INCLOSE BUSINESS CARD FOR DISCOUNTS.

114 SOUTH SECOND STREET.    PHILADELPHIA, PA.

# ADAMANT

WALL PLASTER.

MANUFACTURED BY

Adamant  
Manufacturing  
Company.

OFFICE

63 EAST GENESEE STREET,  
SYRACUSE, N. Y.

## The New, Cheap, and Only Superior Substitute for Common Plaster.

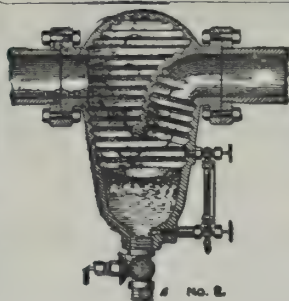
It is hard as marble, and will last as long as the building.  
It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.  
It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.  
It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.  
It does not crack or fall off, even in case of leakages.  
It is applied easily by any good mason.  
It is the only material with which repairing can be done neatly and "to stay."

For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,

For Pennsylvania, **KEYSTONE PLASTER CO.**, 233 No. 23d St., Philadelphia,  
or, " " " " 59 9th Street, Pittsburgh, Pa.

For Massachusetts and Rhode Island, **BAY STATE ADAMANT CO.**, 164 Devonshire St., Boston, Mass.  
For Connecticut, **CONNECTICUT ADAMANT CO.**, 480 Grand Avenue, New Haven, Conn.

For New Jersey, **NEW JERSEY ADAMANT CO.**, 61 Passaic Avenue, Harrison, N. J.



## HINE'S ELIMINATOR

FOR EXTRACTING

**OIL, GREASE AND DIRTY WATER** from EXHAUST, and **WATER** from LIVE STEAM before entering the Heating Pipes and Radiators.

Enhancing heating capacity. Doing away with unpleasant odor incident to old system, and returning the condensation to boiler free from all injurious properties.  
Also Manufacturers of

**DAMPER REGULATORS and REDUCING VALVES.**

**HINE & ROBERTSON, 41 Cortlandt St., N. Y.**

Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.

**J. DUNFEE & CO.,**  
**Wood Carpet and Weather Strips**

OF ALL KINDS,

102 Washington Street, - - CHICAGO.

SEND FOR CATALOGUE.

Factory, 204 to 212 South Clinton Street.

**ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield.** With directions for construction. Four engravings. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT, 59.** Price 10 cents. To be had at this office and of all newsdealers.

**The New Catalogue of Valuable Papers**

contained in **SCIENTIFIC AMERICAN SUPPLEMENT**, sent free of charge to any address.  
**MUNN & CO., 361 Broadway, N. Y.**

## THE HUMPHREY PONY HAND ELEVATOR.

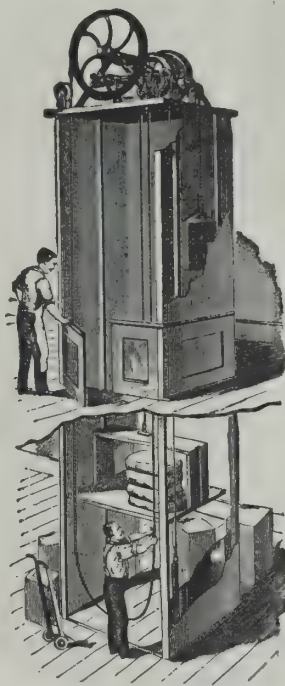
(Patent Applied for.)

For light Store and Factory work, Hospitals and Public Buildings. For Trunk and Invalid lifts. For carrying Coal, Flour, Ashes and other heavy substances in Tenements, Flats and Private Dwellings.

So simple in construction, and price so low that it can be used in many places instead of a dumb waiter, and has many times the lifting capacity. Capacity 500 pounds. Price of fixtures, \$36 per set.

We are also manufacturers of the New York Safety Dumb Waiter fixtures, the most complete, simple and absolutely safe Dumb Waiter fixtures ever made.

Send for Descriptive Catalogue.



**THE EDWARD STORM SPRING CO., Limited,**  
**Poughkeepsie, N. Y.**

or **JOHN H. GRAHAM & CO., Sole Mfrs.' Agents,**  
**113 Chambers Street, New York.**

See September and October Issues of this Journal for Illustrations of Cottages in

## "ROCHELLE .: PARK,"

**NEW ROCHELLE, N. Y.**

Health, Comfort, and Refinement.

**Location.**

"ROCHELLE PARK" is a beautiful tract of 70 acres, in the historic village of New Rochelle, N. Y., 17 miles from New York, on the N. Y., N. H. and H. R.R., only five minutes' walk from the station; overlooks the Sound, and combines every desirable requisite for a suburban home.

**Travel Facilities.**

Thirty-four trains run daily between New York and New Rochelle. The time between stations is 40 minutes, and commutation \$67 per year.

**Natural Features.**

The soil of "ROCHELLE PARK" is gravelly, and the surface rolling, by which perfect drainage is secured. Beautiful trees, many of great age and size, add to its attractions. One of the most competent landscape engineers has planned its drives, walks, lawns, etc., with unusual breadth and freedom of design, and so secured the most satisfactory park effects. Each lot is 100 x 200 feet.

**The Entrance Gate.**

But 400 yards from the station, is a striking and beautiful design, and gives the idea of a large private estate rather than that of a public park.

**Terms.**

Liberal inducements offered to desirable purchasers. Large percentage can remain on bond and mortgage at 5 per cent.

Rochelle Park is not a land scheme, is not a speculation, and is not a monopoly. As a place of quiet, refined, and convenient suburban residence, Rochelle Park is unsurpassed.

For prospectus and further particulars apply to

**H. B. STOKES, New Rochelle, N. Y., or 156 and 158 Broadway, New York.**



**PANCOAST & ROGERS,**

GENERAL AGENTS FOR

READING IRON WORKS, Wrought Iron Pipe, Boiler Tubes, Artesian and Oil Well Tubing, Casing, Line Pipe, etc. Special work of every kind in Wrought Iron.

CHAPMAN VALVE MFG. CO. Valves and Gates for Gas, Steam, Water, Oil, etc., 1/2" to 48" diam. Fire-Hydrants.

THE WATERBURY MALLEABLE IRON CO. Malleable and Gray Iron Fittings for Gas, Steam, and Water.

MANUFACTURERS' AGENTS FOR

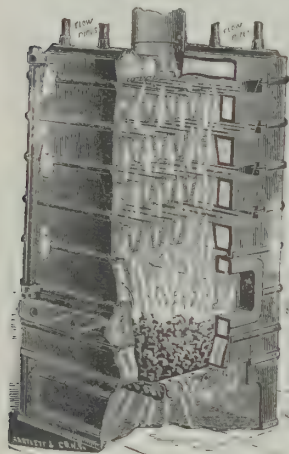
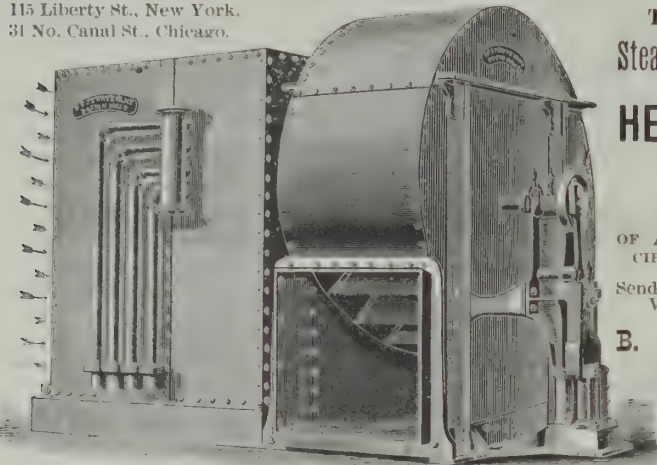
**CAST IRON WATER & GAS PIPES, SPECIAL CASTINGS,**  
And Dealers in Supplies of Every Description.

Office &amp; Warehouse, 28 Platt &amp; 15 Gold Sts., New York.

115 Liberty St., New York.  
31 No. Canal St., Chicago.**THE STURTEVANT**  
Steam Hot Blast Apparatus**FOR**  
**HEATING and**  
**VENTILATING**  
**BUILDINGS**OF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.Send for Illustrated Treatise on  
Ventilation and Heating.**B. F. STURTEVANT,**  
**BOSTON, MASS.**

BRANCHES:

New York. Chicago.

**"PERFECT"**

TRADE MARK

**Hot Water**  
**Heater.****Hot Water**, as a medium for heating **Private and Public Buildings**, is largely engrossing the attention of the **public**, as being more satisfactory and certain in its operation, and more easily managed than **Steam**. Having constructed a **Hot-Water Heater** that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

**Richardson & Boynton Co., Mfrs.,**  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.**The Globe Steam Heater**

Has been thoroughly tried in many private and public buildings and always found to be the best. Very economical, and easily managed.

Large surface exposed directly to the fire. Ask for all particulars before you place your order for any other.

**THE GLOBE SAFETY DAMPER REGULATOR SHOULD BE USED ON EVERY STEAM HEATER IN USE.**

For new Illustrated Price List of Globe Steam Heating Appliances, address

**Globe Steam Heater Co., North Wales, Pa.****THE BOYNTON FURNACE CO.**

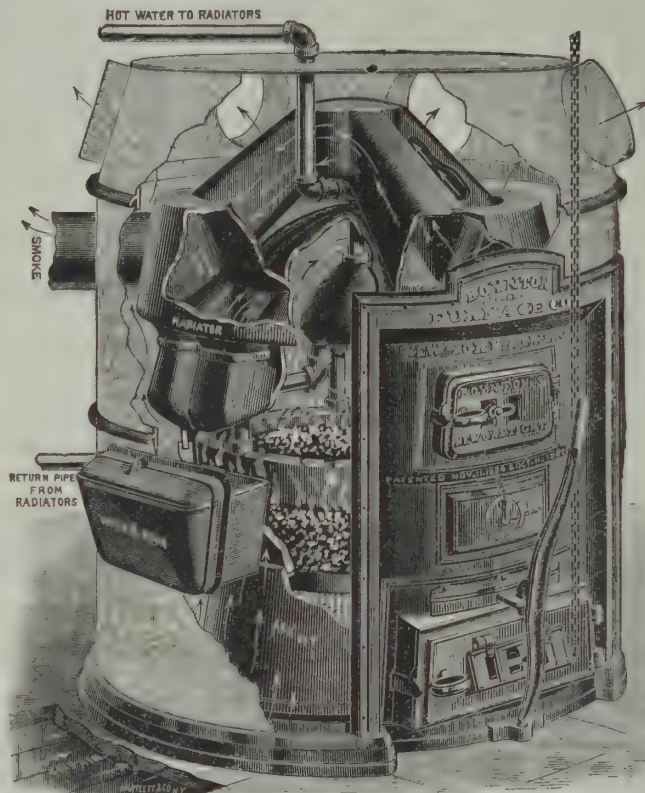
207 &amp; 209 WATER STREET, NEW YORK;

47 &amp; 49 DEARBORN STREET, CHICAGO, ILL.,

—SOLE MANUFACTURERS OF—

**Boynton's "New Gas Tight" Self-Clearing Hot Air**  
**Furnace with Hot Water Combination.**

Patented October 11th, 1887.

**THOROUGHLY TESTED, AND NO EXPERIMENT!**

Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

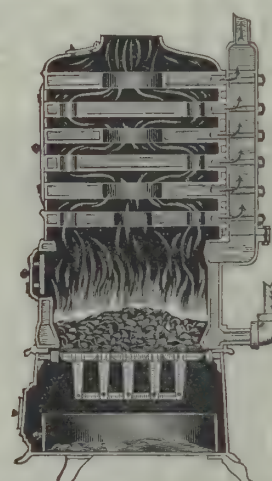
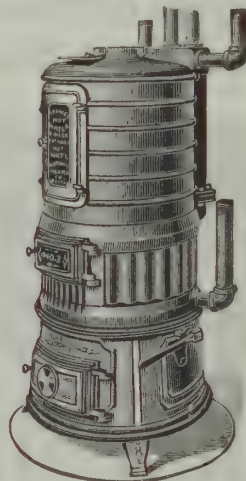
The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The **HOT WATER HEATER** is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or all Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.



SEND FOR DESCRIPTIVE CIRCULARS.

**National Hot Water Heater Company,**

MANUFACTURERS OF

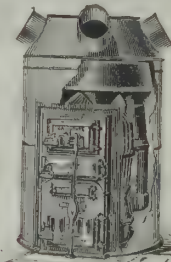
**The Spence Hot Water Heaters,**

191 Fort Hill Square, Boston, Mass.

ESTABLISHED 1836.

**BARSTOW STOVE COMPANY,**

—MANUFACTURERS OF—

**Cast Iron and Steel Plate Furnaces,**  
**Portable and Brick Set Ranges, Parlor**  
**Stoves, and Baltimore Heaters.**

SEND FOR ILLUSTRATED CATALOGUE.

**BARSTOW STOVE CO.,**230 Water Street, NEW YORK; 56 Union Street, BOSTON;  
PROVIDENCE, R. I.**USEFUL BOOKS.**

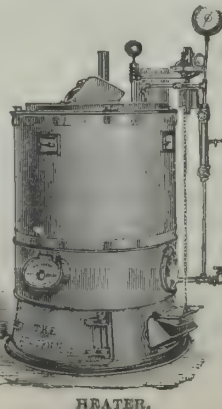
Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,

**MUNN & CO., 361 Broadway, New York.****THE IMPROVED**  
**Auburn Boiler**

—FOR—

**Steam or Hot Water.****AUTOMATIC, SELF-FEEDING, PORTABLE.**

Requires attention but once in from twelve to twenty-four hours. Fuel magazine surrounded by water. Self-locking shaking grate. Waste of coal impossible. No dust. No gas.

**Woodcock & Co., Auburn, N. Y.**

HEATER.

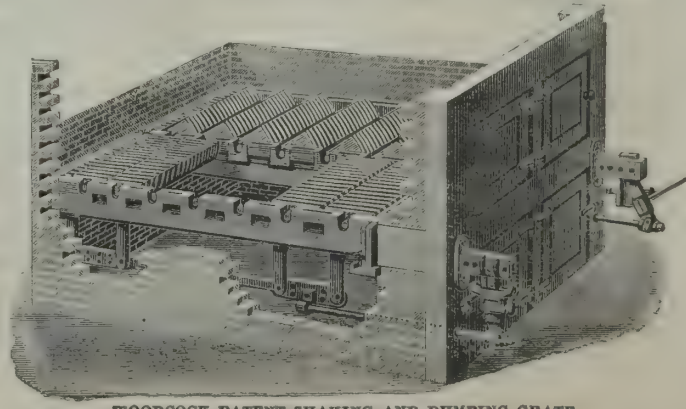
**THE**  
**Woodcock Patent Shaking Grate,**

—FOR—

**BOILER FURNACES**  
OF ALL DESCRIPTIONS.

Saves its cost in a year, supplanting all other shaking grates. No waste of coal. No burnt or broken grates. Self-locking, and as nearly automatic as a grate can be made.

Send for Illustrated Catalogue.

**Woodcock & Co., Auburn, N. Y.**

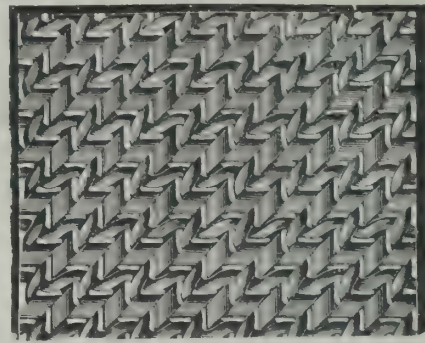
WOODCOCK PATENT SHAKING AND DUMPING GRATE.





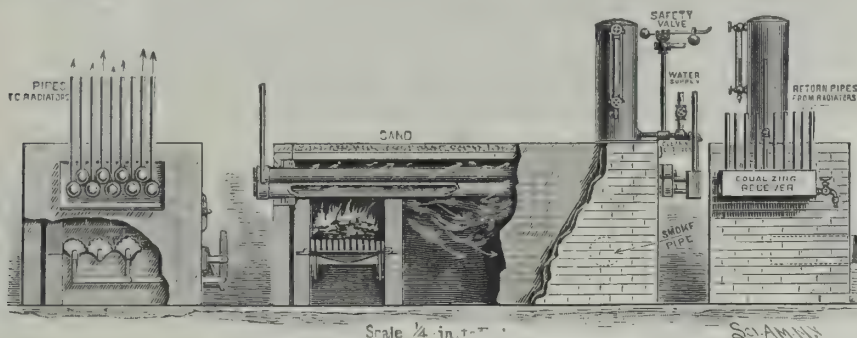
That Beautiful, Ornamental and Decorative Woodwork  
FOR DOORS, TRANSOMS, ARCHES AND WINDOWS, KNOWN AS  
**MOORISH FRET WORK,**  
IS MANUFACTURED ONLY BY  
**C. S. RANSOM & CO.,**  
**CLEVELAND, O.**

There is no limit of design into which this work can be made. It is made of any domestic or imported woods, finished, natural, stained, or in white and gold or bronzes. All leading decorating, drapery, or furniture houses will supply you. Patented as an article of merchandise Sept. 15, 1885.  
New York Office, 5 West 27th Street.



## GATES IMPROVED HOT WATER HEATER.

This is the only system of heating which, with cold weather and warm rooms, has smoke pipe only warm. I have never seen steam heater, furnace, or other hot water heater that would do this. Hence, greater economy of fuel over all others. And while this possesses every advantage that others have, this also has the positive circulation to each room due to the independent boiler system. Notice, this is the only system having tank for water supply in cellar, and will, for a month at a time, supply water automatically to each radiator. This works by air pressure. Improved noiseless circulation. Stops the overflow which is liable to occur with open tanks in upper rooms. No overflow to wet ceilings and ruin house. Perfect combustion of fuel, because no water comes around the fire, and more boiler surface exposed to fire than usual to do same work. Boilers for house heating each  $\frac{3}{4}$  in. in diameter, 8 ft. 6 in. long.



SOME OF PARTIES USING THIS SYSTEM.

Senator Hartwell, Geo. F. Simonds, C. H. Whittemore, A. W. Baker, H. F. Coggeshall, E. A. Goodrich, Alonzo P. Goodrich, John M. Carpenter, David E. Rand, Fitchburg, Mass.; Dr. Hartwell, Ayer, Mass.; D. G. Hitchcock, Warren, Mass.; O. L. Cowles, J. U. Johnson, Springfield, Mass.; E. L. Lyman, J. G. Bishop, Holyoke, Mass.; S. P. Gardner, Haverhill, Mass.; Dr. E. E. Denniston, S. D. Drury, Geo. F. Drury, O. C. Bridgman, R. S. Bartlett, Northampton, Mass.; S. E. Snow, J. S. Wilcox, Deep River, Conn.; J. W. Rigdon, Topeka, Kansas; A. N. Stanton, Bridgeport, Conn.; Heslop & Curtis, A. C. Van Gilder, Point Pleasant, W. Va.; Mrs. A. E. Leonard, Westfield, Mass.; C. A. Gridley, So. Hadley, Mass.

For full particulars and price, address

E. N. GATES, Box 1504, Fitchburg, Mass.

## The Guion Automatic Heat Regulator

**AUTOMATIC, ECONOMICAL, PRACTICAL!**  
THE TEMPERATURE OF YOUR HOUSE PERFECTLY UNDER YOUR CONTROL.

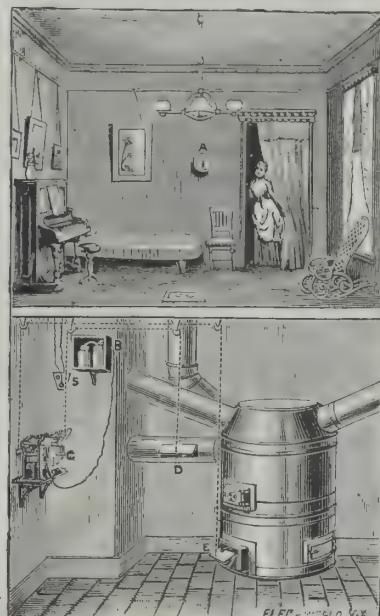
CORNELL UNIVERSITY, ITHACA, N. Y., April 23, 1888  
GUION AUTOMATIC HEAT REGULATOR CO.  
Gentlemen: I am pleased with your Regulator and think that it has great merit. Yours respectfully

AND, D. WHITE

If you have a Heater in your house or are building a home write us for a circular. We want an agent in every town and city of the United States and Canada. Electricians and Furnace Dealers write for terms. Correspondence is solicited from Architects, Builders, and Manufacturers of Furnaces, Steam and Hot Water Heaters. Address

The Guion Automatic Heat Regulating Co.  
**ELMIRA, N. Y.**

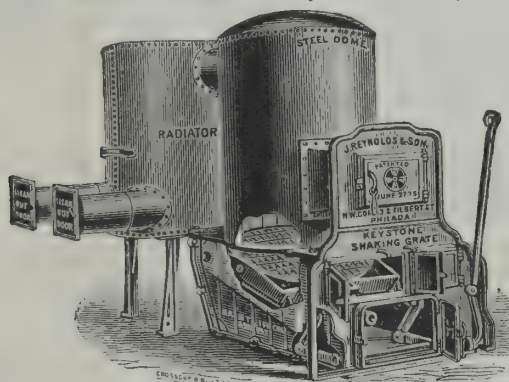
A shows the location of the thermostat on the walls of the room. This is connected by concealed wires with the battery Band clock-work C. in the cellar. The operation is as follows: When the temperature in the room reaches the point at which the thermostat is set, it connects the circuit through the clock-work. This starts the clock-work and opens the check damper in the smoke-pipe, and closes the draft in front. When the temperature in the room falls one degree, then the clock-work is again started and reverses the operation, putting on the draft again. The switch S is used to disconnect the circuit when the furnace is not in use.



"The Best is the Cheapest."

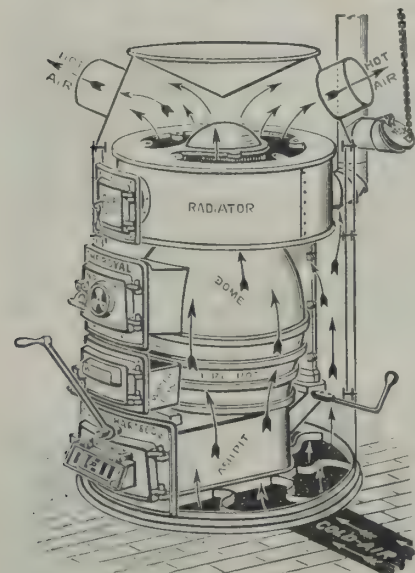
"A Perfect Furnace at Last."

**Keystone Steel Furnaces,**  
**Air Tight Steel Furnaces,**  
Manufactured by **J. REYNOLDS & SON,**  
**13th and Filbert Sts., Philadelphia.**



These Furnaces are supplied with **THE "REYNOLDS CLINKER CUTTING GRATE"** with Patent Dumping Attachment, the best **LABOR** and **FUEL SAVING** invention ever applied to **HEATING APPARATUS**. It is perfection. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly **GAS, SMOKE** and **DUST TIGHT**.  
**SEND FOR CIRCULAR.**

## The "ROYAL"



Hot Air Furnace.

MANUFACTURED BY

**H. GILBERT HART & CO.**  
**UTICA, N. Y.**

SEND FOR CATALOGUE.

**DUPLEX GRATE.**

**GAS TIGHT.**

**A STRICTLY FIRST-CLASS FURNACE.**

(Iron Beam Protection. Patented June 3, 1884.)  
**HENRY MAURER & SON,**  
MANUFACTURERS OF  
**FIRE-PROOF MATERIAL**  
Of every description. Hollow Brick made of Clay for Flat Arches, Partitions, Furring, etc. Porous Terra Cotta, Fire Bricks, etc., etc.  
Office and Depot, 420 East 23d St., New York.  
WORKS, PERTH AMBOY, N. J.

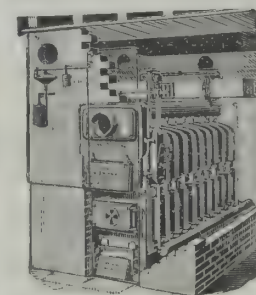
**SECTIONAL INSULATED AIR COVERINGS**  
FOR  
**PIPES, BOILERS, DRUMS,**  
AND ALL OTHER  
HOT & COLD SURFACES  
**SHIELDS & BROWN CO.**  
143 WORTH ST. 240 & 212 RANDOLPH ST. NEW YORK. CHICAGO.

**Fine Office & Bank Fittings** BRASS & WIRE WORK.  
**A. H. ANDREWS & CO.** 195 Wabash Ave., Chicago, and 686 Broadway, N. Y.

**WELL** Encyclopedia of 700 Engravings of WELL TOOLS, Diamond Drills and Lightning Hydraulic Machines.  
Book free, 25c. for mailing it.  
American Well Works, Aurora, Ill.  
Branch House: 11 and 13 S. Canal St., Chicago, Ills.

**BIBB'S** Celebrated Original  
**BALTIMORE FIRE-PLACE HEATERS**  
To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world.  
**THE B. C. BIBB STOVE CO.**  
Stove Foundry, Baltimore, Md.  
MARBLIZED SLATE MANTELS  
Send for Circulars and prices.

**Steam & Hot Water Heating Apparatus**  
For Public Buildings, Residences, Etc.



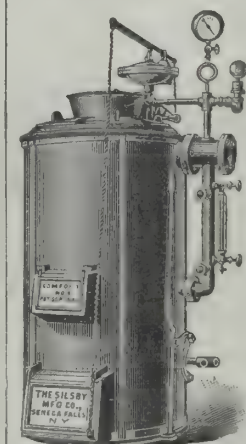
Our Specialties:  
The Union Hot Water Radiator; Gold's Patent Sectional Boiler; Mill's Patent Safety Boiler; Reed's Cast-Iron Radiators; Indirect Pin Radiators.

**The H. B. Smith Co.**  
137 Centre St., New York.  
Foundry, Westfield, Mass.  
Send for Circulars.



EDWIN LEE BROWN, Pres't.  
**The Western Sand Blast Co.,**  
Ornamenters of Glass for  
**VESTIBULE DOORS, TRANSOMS, BANK & OFFICE COUNTERS,**  
AND  
Manufacturers of Advertising Glass Signs.  
Sand Blast & Embossed Railroad Glass a specialty.  
N. W. Cor. Clinton & Jackson Sts., CHICAGO, ILL.  
Telephone 4085.

## STEAM HEATERS.



The most Reliable Durable, and Economical in the market.

**Simple, Cheap, Safe.**

Require no brick work.

Are absolutely automatic.

A servant or child can manage them.

Send for Illustrated Catalogue.

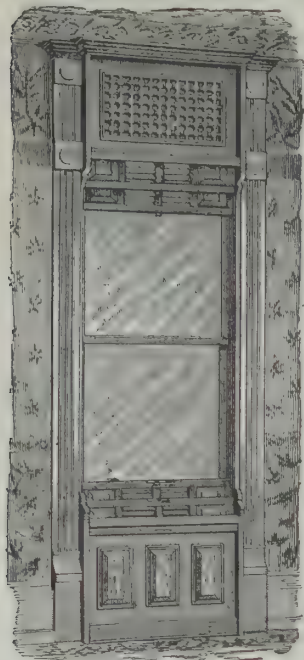
**The Silsby Manuf'g Co.,**  
**221 FALL STREET,**  
**SENECA FALLS, N. Y.**



**Eight Foot Eave Trough and Gutters.**  
**HATTEN, GALPIN & CO., BINGHAMTON, N. Y.**

**HATTEN, GALPIN & CO.**





## WILLER'S PATENT INSIDE SLIDING BLINDS

ARE ACKNOWLEDGED THE  
STANDARD SLIDING BLINDS  
OF THE COUNTRY.

They are used in preference to any other  
by the  
**LEADING ARCHITECTS.**

THEY ARE THE ONLY SLIDING BLINDS GIVING  
Universal Satisfaction.

For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**  
Sole Manufacturer,

Fourth and Cedar Streets, Milwaukee, Wis.  
**AGENTS WANTED EVERYWHERE.**

State your business when writing for catalogue or agency.

EDWARD FORD, PREST.  
A. PITCAIRN, VICE-PREST.

E. L. FORD, SECY.  
JOHN F. SCOTT, TREAS.

## PITTSBURGH PLATE GLASS CO., CREIGHTON, PA.,

MANUFACTURERS

## POLISHED PLATE GLASS.

Ground and Rough Plate Glass for Floors and Skylights.

Three-sixteenths thickness, made expressly for fine residences.

### LARGE AND WIDE GLASS A SPECIALTY.

The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.

## IMMENSE PRODUCTION.

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.

The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.

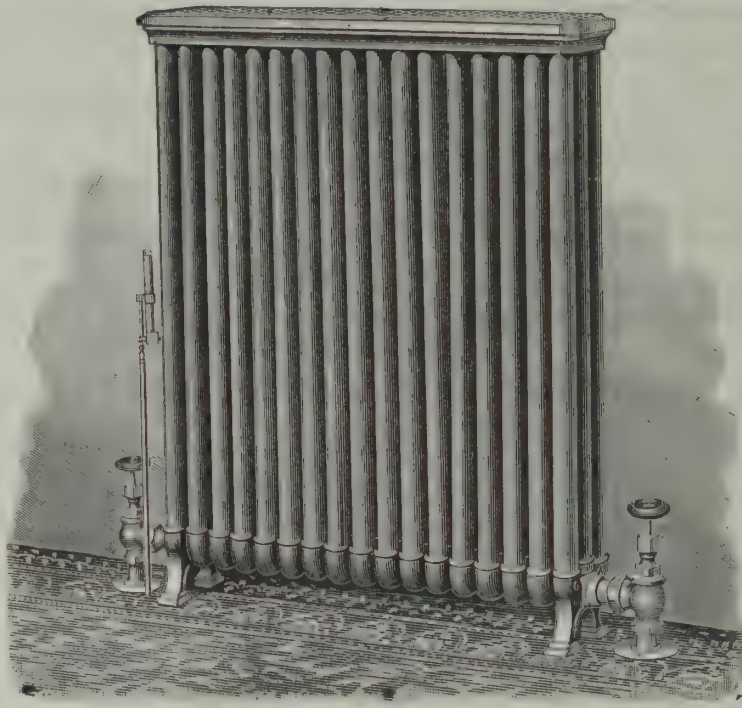
—CORRESPONDENCE SOLICITED.—

Works No. 1,  
**CREIGHTON, PA.**

Works No. 2,  
**TARENTUM, PA.**

WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL  
OFFICE, CREIGHTON, PA.

**THE BRIDGEPORT WOOD FINISHING CO**  
G. M. BREINIG, AGENT, PRINCIPAL OFFICE & MANUFACTORY NEW MILFORD, CONN.  
NEW YORK BUSINESS OFFICE, 98-99 MAIDEN LANE. MANUFACTURERS OF  
**WHEELERS PATENT WOOD FILLER.**  
BREINIG'S LITHOGEN SILICATE PAINT.  
LITHOGEN PRIMER, WOOD STAINS  
SILEX FLINT AND FELDSPAR.  
PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.



**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
STEAM HEATING ENGINEERS.

Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.

## ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION OF THE SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

**MUNN & CO., Publishers,**  
361 Broadway, New York.



Samples and Descriptive Price List free by mail.

**H. W. JOHNS MANUFACTURING COMPANY,**  
SOLE MANUFACTURERS OF  
H. W. Johns' Asbestos Roofing,  
Fire-Proof Paints, Building Felt,  
Steam-Pipe and Boiler Coverings.  
Asbestos Steam Packings, Gaskets, etc.,  
Vulcanized Moulded Rings, Washers, etc.  
**87 MAIDEN LANE, NEW YORK.**

## A NEW CATALOGUE —OF— A VALUABLE PAPERS

Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.  
**MUNN & CO., 361 Broadway, New York.**

## HARTMAN'S PATENT INSIDE SLIDING WINDOW BLIND.



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

Agents wanted everywhere.

Send for illustrated Catalogue and prices to

**Hartman & Durstine,**  
WOOSTER,  
Ohio.

Mfrs for U. S. A.

Withrow & Hillock,

TORONTO, Can.,  
Mfrs. for the Dominion of Canada.

## PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-one years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

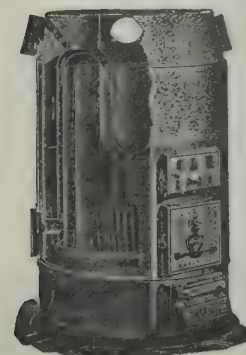
We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

**MUNN & CO., Solicitors of Patents,**  
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

**ICE-BOATS — THEIR CONSTRUCTION**  
and management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

**CRIMPED & CORRUGATED**  
**STEEL ROOFING**  
SIDING, CEILING, METAL SHINGLES  
MANUFACTURED BY  
**W. G. HYNDMAN & CO. CINCINNATI, O.**



## "Alsop" Warm-Air and Combination Warm-Air and Steam Furnace THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

**IN OFFERING** this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a new departure in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

**This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation.**  
**Manufactured by the ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.**





## THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.

### TILES.

**NEW PRINCIPLE.** Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

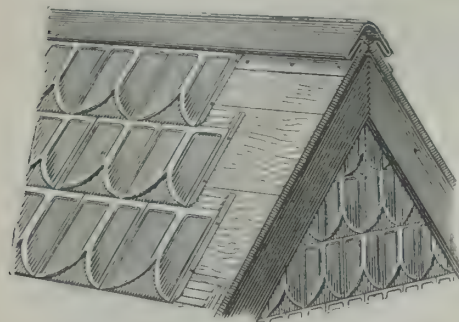
### SHINGLES.

**Gothic Pattern.** The BEST SHINGLE ever offered the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

Illustrated Catalogue mailed to any address an application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.



Our Gothic Shingle and Plain Ridge Coping.

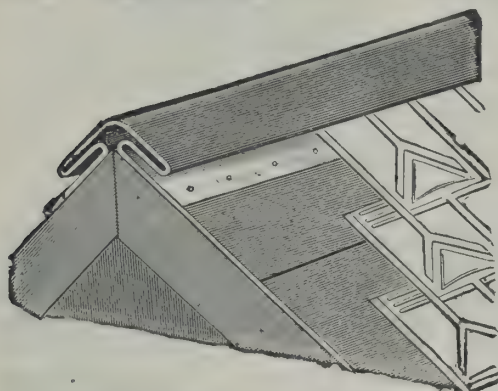


Shield Tiles as laid on roof with Roll Ridge Coping

## Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

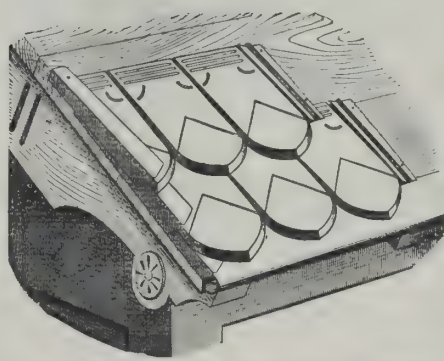
A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Walter's Patent Standard Metallic Shingles.

### WHOLESALE AGENTS.

W. W. MONTAGUE & Co., San Francisco, Cal., Pacific Coast.  
PHILLIPS & BUTTORFF MFG. CO., Nashville, Tenn.  
MCDONALD, KEMP & Co., Toronto, Sole Agents, Canada.  
KNISELY & MILLER, Chicago, Ill.  
J. J. WALTERS, Denver, Col.  
JEROME TWICHELL & Co., Kansas City, Mo.



Cooper's Patent Queen Anne Metallic Shingles.



THE NATIONAL SHEET METAL ROOFING CO.,  
510, 512, 514, 516, 518 & 520 East 20th St., New York.

## PEERLESS BRICK CO.

PHILADELPHIA, PA.

1003 WALNUT ST.

WORKS—70 Acres—Old York Road and  
Nictown Lane.

PLAIN, PRESSED FRONT,  
ORNAMENTAL & MOLDED

## BRICKS

MADE OF

### THOROUGHLY TEMPERED CLAY.

16,000,000 Bricks Annually.

5,000,000 Pressed Front Bricks,

### 600 DIFFERENT DESIGNS AND SHAPES.

VARIOUS SIZES, COLORS, AND SHADES.

Red, Buff, Drab, Brown, Gray,  
Black, White and Pompeian.

Orders filled for large quantities of Pressed Front or Face Bricks of any one shade.  
**BRICK FIRE PLACES and MANTELS.**  
ARCHES of all kinds ground and fitted from drawings furnished to us. Full size working plans sent with bricks.  
**SPECIAL SHAPES** made from designs furnished us by Architects. Bricks shipped in cars at our works for all parts of the country. Illustrated Catalogue and Price List sent on application.

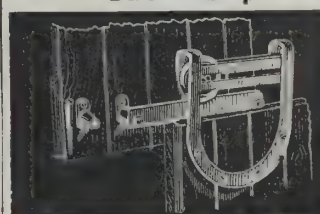


## AUGER BITS.

Square, Oval, Round, Smooth Boring, for fine carpenter, cabinet, and pattern work.  $\frac{1}{8}$  in. bit 50c.; set of five,  $\frac{1}{4}$  to  $\frac{3}{4}$  in. \$4.00, free with list, by mail, receipt of price. **BRIDGEPORT GUN IMPLEMENT CO.,** 17 Maiden Lane, New York.

## LANE'S PATENT STEEL DOOR HANGER

The most perfect Anti-Friction Hanger in the Market.



**BECAUSE**  
It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

**LANE'S PATENT TRACK**  
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

Manufactured by **LANE BROS.,** Poughkeepsie, N. Y.

**JOHN H. GRAHAM & Co.,** General Agents, 113 Chambers St., N. Y.

SOLD BY HARDWARE DEALERS GENERALLY.

## PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-one years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

**MUNN & CO., Solicitors of Patents,**  
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

## SENECA FALLS PUMP & FIRE APPARATUS WORKS

### PUMPS FOR ALL PURPOSES

## SENECA FALLS PUMP & FIRE APPARATUS WORKS

**RUMSEY & CO. (LIMITED) PROPRIETORS, SENECA FALLS, N.Y. U.S.A.**

## VALUABLE BOOKS FOR ARCHITECTS, BUILDERS, ETC.

Promptly sent, on receipt of price, by **MUNN & CO.,** 361 Broadway, New York City.

Send for Book Catalogue.

**Artistic Homes.**—Containing 44 Plates of Queen Anne and Colonial Style Villas and Cottages, costing from \$700 upward. One of the latest and best works on the subject. By A. W. Fuller, Architect. One large (8 1/2 x 12 inches) volume, handsomely bound in cloth.....\$4.50

**Bricklaying.**—The Rudiments of Practical Bricklaying. In six Sections: General Principles; Arch Drawing, Cutting, and Setting; Pointing; Paving, Tiling, Materials; Slating and Plastering; Practical Geometry, Mensuration, etc. By Adam Hammond. Fifth edition.....\$1.00

**Building Superintendence.**—By Professor Theodore M. Clark. 1 vol. Profusely illustrated with plans, diagrams, etc. Price.....\$3.00  
The countless problems involved in the over-

seeing of the construction of buildings are stated, studied, and solved in a practical, direct and perfectly comprehensible manner.

**Builder's Guide and Estimator's Price Book.**—Being a compilation of current prices of Lumber, Hardware, Glass, Plumbers' Supplies, Paints, Slates, Stones, Limes, Cements, Bricks, Tin, and other Building Materials. Also, Prices of Labor and Cost of Performing the Several Kinds of Work required in Building. By Fred. T. Hodgson, editor of the "Builder and Wood Worker".....\$2.00

**Architect's and Builder's Pocket Companion and Price Book.**—Consisting of a short, but comprehensive, Epitome of Decimals, Duodecimals, Geometry and Mensuration; with

Tables of United States Measures, Sizes, Weights, Strengths, etc., of Iron, Wood, Stone, Brick, Cement and Concretes, Quantities of Materials in given Sizes and Dimensions of Wood, Brick and Stone; and full and complete bills of prices for carpenter's work and painting; also, Rules for Computing and Valuing Brick and Brick Work, Stone Work, Painting, Plastering, with a Vocabulary of Technical Terms, etc. By Frank W. Vogdes, Architect, Indianapolis, Ind. Enlarged, revised, and corrected. In one volume, 388 pages, full bound, pocket-book form, gilt edges, \$2.00; cloth.....\$1.50

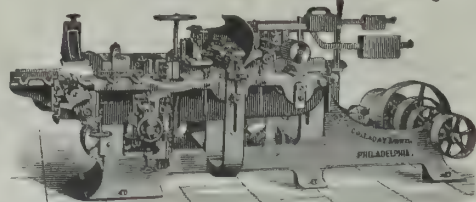
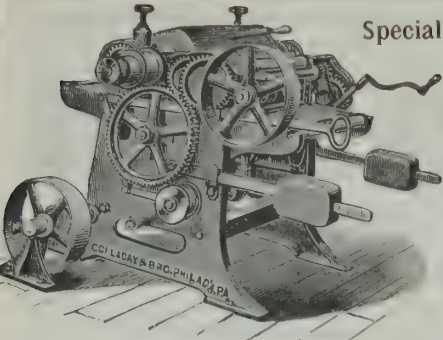
**Warming and Ventilating.**—A Practical Treatise on Warming Buildings by Hot Water, Steam, and Hot Air, on Ventilation, and the

various Methods of Distributing Artificial Heat, and their Effects on Animal and Vegetable Physiology. To which are added an Inquiry into the Laws of Radiant and Conducted Heat, the Chemical Constitution of Coal, and the combustion of Smoke. By Charles Hood, F.R.S., F.R.A.S., etc. Sixth edition, reprinted from the fifth. 8vo, cloth.....\$5.00

**Woodward's National Architect.**—Vol. I.—1,000 Designs, Plans, and Details for Country, Suburban, and Village Houses. Cloth, 4to.....\$7.50  
Vol. II.—Embracing New and Original Designs, Plans, Elevations, Sections, and Detail Drawings to Working Scale for City and Country Houses. 100 4to plates. Cloth, 4to.....\$7.50

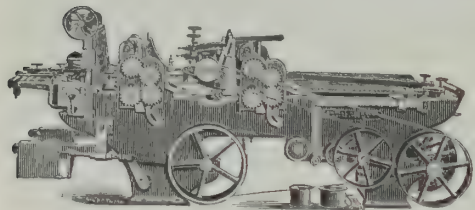


Special Wood Working Machinery

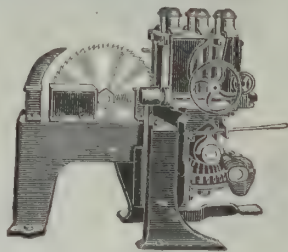


For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc.  
Manuf'd by Joseph O. Colladay & Bro.,  
Nicholson & Race Street, Philadelphia.

Woodworking Machinery, Planers and Matchers, Pony Planers, Hand Matchers, Solid Plate and Segment Re-Saws.

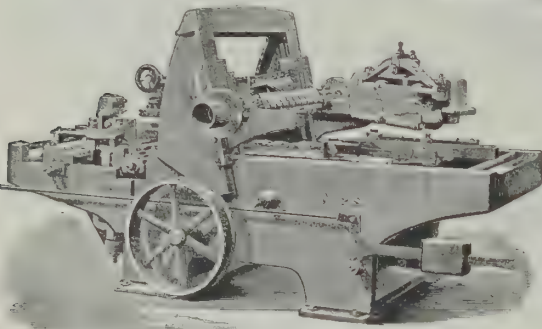


PLANER AND MATCHER.



SIDING SAW.

CONNELL & DENCLER, Rochester, New York.



HOYT & BROTHER CO.  
AURORA, ILL.

MANUFACTURERS OF

Machinery for Working Wood.

Planing Mill Machinery  
a Specialty.

Send for Catalogue.

MARSTON'S IMPROVED

Hand and Foot Power Band Saw.

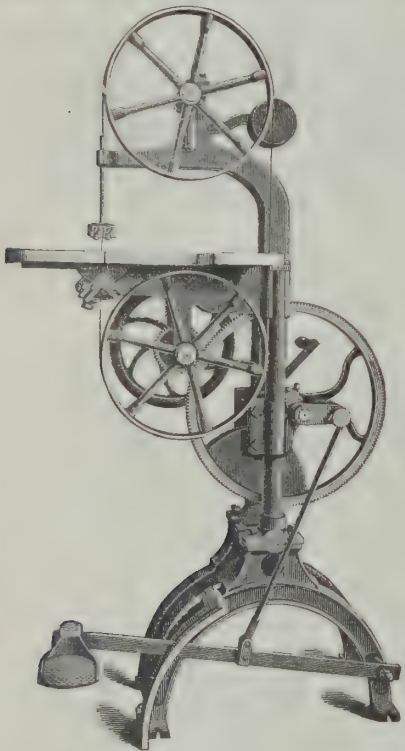


Table is 3 feet 6 inches from floor; measure 18 x 21 inches; is adjustable for cutting on a bevel Guide for saw both above and below table. Distance from table to guide when raised its full height, 5 inches; 16 inches between saw and frame. All gears cut from solid iron. Shafts are made of steel. Saw pulleys covered with rubber. Upper saw pulley has adjustment to bring it into line with lower saw pulley. Weight of machine, 260 lbs. Machines on trial.

J. M. MARSTON & CO.,  
Cor. Appleton & Tremont Sts.,  
Boston, Mass.



WOOD FLOORS  
BOUGHTON & TERWILLIGER  
253 ST. FIFTH AVE. HOTEL  
UNDER WAINSCOTING - N.Y.  
CEILINGS

MANAHAN'S  
Waterproof Parchment,  
Strongest and Lightest Sheathing.

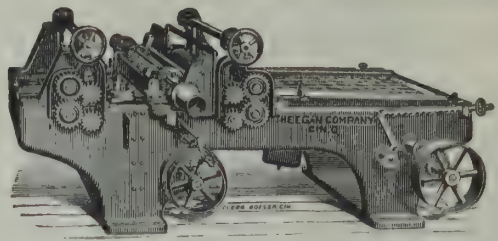
One Dollar's worth covers more ground than same amount of most sheathing. Send for Samples.

HALLETT BROS., Sole Agents,  
290 Devonshire St., BOSTON.

Screw Plates. Adjustable Die.  
Send for CATALOGUE  
F. F. F.

WELLS BROS. & CO., GREENFIELD, MASS.  
MANUFACTURERS OF  
Screw Cutting Machinery and Tools for Machinists,  
Carriage Makers, and Blacksmiths' Use.

E  
F  
F  
I  
C  
I  
E  
N  
T



D  
U  
R  
A  
B  
L  
E

No. 3 Planer and Matcher.

THE

EEGAN COMPANY,

BUILDERS OF

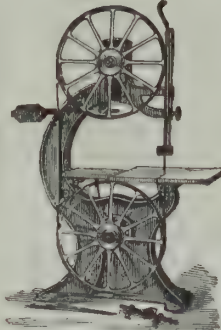
Woodworking  
Machinery

For Builders, Carpenters,  
Planing Mills, and General  
Woodworkers.

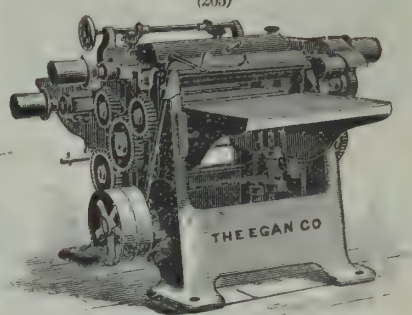
209 to 229 W. Front St.

Cincinnati, Ohio, U. S. A.

Complete Outfits Furnished,  
Write for Catalogue & Prices



No. 2 Band Saw.



No. 2 1/2 Double Cylinder Planer.  
Planes 26 inches wide and 6 inches thick.



Sectional Panel Ornamental Grille Work.

CUTTING & DE LANEY,  
Buffalo, N. Y.,  
ARTISTIC

Wood Workers.

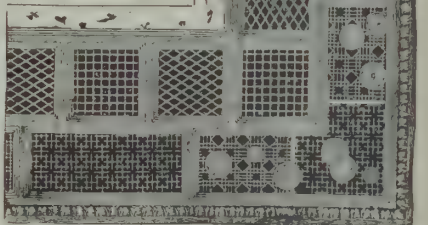
East Indian, Japanese, and  
Moorish

Decorative Lattice.

Special Designs To Order.

FINE CARVED  
Furniture.

Place of Border Ceiling  
of Decorative Lattice.



E. P. WILCE & CO.,

MANUFACTURERS OF

DOORS, SASH AND BLINDS

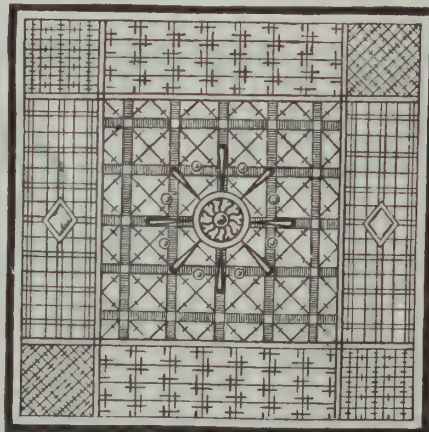
FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

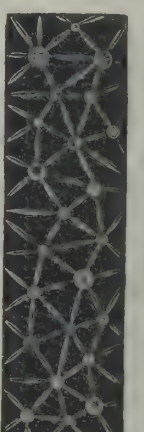
Stair Work and Interior Finish, Mantels, Sideboards, Pulpits,  
Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets,

CHICAGO.



Centre Piece of Ceiling Pattern of Japanese Lattice.



Mankey Decorative Company,  
Williamsport, Pa.,

Incorporated Sept. 9, 1885.

CAPITAL \$100,000.

—MANUFACTURERS OF—

Artistic Wood Decorations for Public and Private Buildings

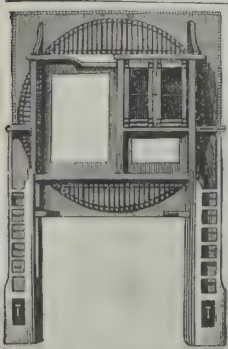
MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

WOOD MANTELS and DOORS A SPECIALTY.

ART STAINED GLASS

FOR CHURCHES, DWELLINGS, Etc.

Keystone Stained Glass Works,  
271 SOUTH 5th ST., PHILADELPHIA.





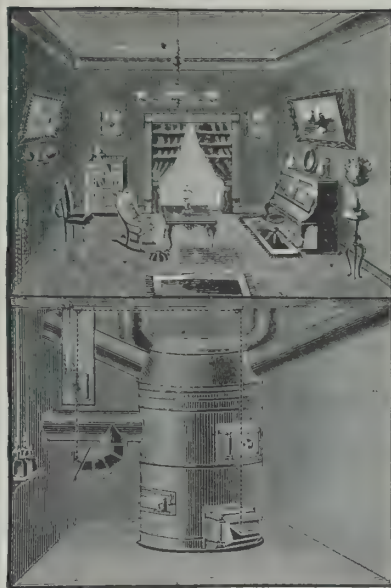
YOUR CEILING IS CRACKED AND BROKEN.  
LOOK AT SOMETHING NEW, NEAT, AND DURABLE.



Church. School. Hall. Theater. Store. Parlor. Library. Kitchen.

Far surpassing either plaster or wood ceilings. Send size and diagrams of rooms and get special designs. These ceilings are covered by six original Patents.

**A. NORTHROP & CO., SOLE MANUFACTURERS, PITTSBURGH, PA.**  
NEW YORK AGENCY: **JOHN McALLUM, Cor. Washington & Vestry Streets.**



Cut showing application of Regulator to Hot Air Furnace.  
Local Companies; A. M. BUTZ & CO., 154 Lake St., Chicago, Ill.

## AUTOMATIC REGULATORS

FOR  
Steam Heaters, Hot Water Heaters,  
Hot Air Furnaces,  
And all other kinds of Heating Apparatus.

Perfect Control of Temperature in Private Residences, Public Buildings, School Houses, Churches, Railway Cars, Green Houses, etc.

The Automatic Electric Heat Regulator controls the Furnace or Heater by the temperature of the living rooms of the house. If the temperature of the room rises above the desired degree the Regulator instantly closes the drafts of the Furnace and opens a check-damper in the smoke-pipe. If the temperature drops below the desired degree, the Regulator instantly closes the check-damper and opens the drafts of the Furnace. The Regulator can be set for any desired temperature, and thus the house can be kept at a lower temperature at night, or the same uniform temperature may be maintained day and night. Can be applied to any kind of heating apparatus.

We wish to establish a local company in each State, to whom exclusive privileges under all our patents will be guaranteed. This company controls all the patents of Bradford, Butz, Sternberg, Draper and Thompson. These are foundation patents and cover broadly Automatic Electric Heat Regulators. Do not buy, sell or use any infringing Apparatus. Write for Illustrated Catalogue.

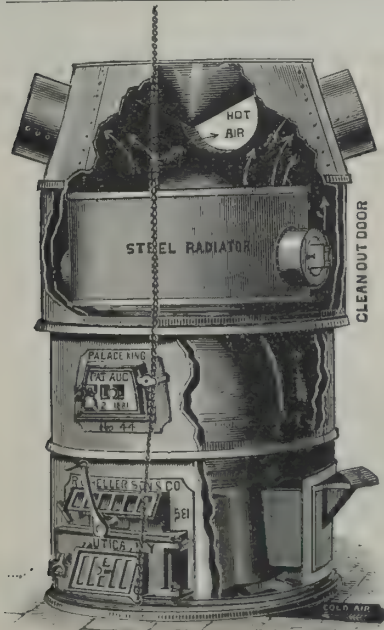
**Consolidated Temperature Controlling Co.**  
809 HENNEPIN AVENUE,  
**MINNEAPOLIS, MINNESOTA.**

N. E. HEAT REGULATOR CO., 61 Bromfield St., Boston, Mass.

## Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

Change of copy for advertisements should reach us not later than 15th of month to appear in issue following.

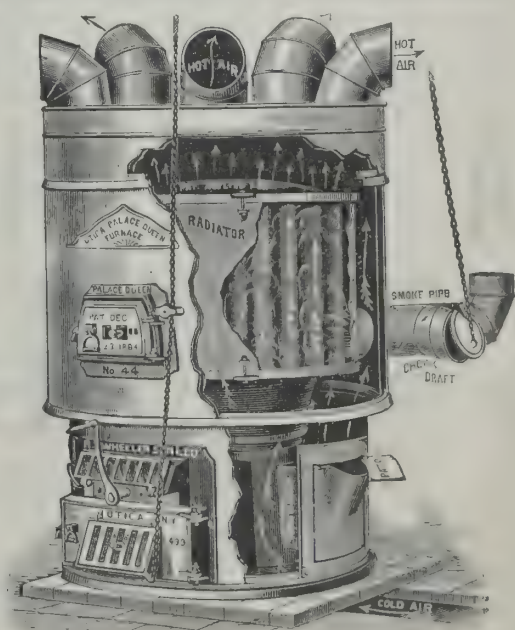
<b>Adjustable Planes.</b> Stanley Rule & Level Co. .... cover ii	<b>Brick.</b> Chicago Anderson Pressed Brick Co. .... xi Peerless Brick Co. .... xi	<b>Decorative Lattice.</b> Cutting & De Laney ..... xii C. S. Ransom & Co. .... ix	<b>Foot and Hand Power Machinery.</b> Page W. F. & J. Barnes Co. .... ii C. E. Little ..... ii J. M. Marston & Co. .... xii Fred. A. Rich ..... v Sebastian May & Co. .... vi Seneca Falls Mfg. Co. .... ii John Wilkinson Co. .... xi
<b>Advertising Glass Signs.</b> The Western Sand Blast Co. .... ix	<b>Brick Machinery.</b> Henry Martin ..... v	<b>Door Knobs.</b> Dibble Mfg. Co. .... v	<b>Furnaces.</b> Abram Cox Stove Co. .... cover iii Barstow Stove Co. .... viii Boynton Furnace Co. .... viii Alsop Furnace and Stove Co. .... x H. Gilbert Hart & Co. .... ix Howard Furnace Co. .... cover ii E. A. Jackson & Bro. .... cover ii Leibbrandt & McDowell Stove Co. .... i J. F. Pease Furnace Co. .... i J. Reynolds & Son ..... ix Richardson & Boynton Co. .... viii R. Wheeler, Son & Co. .... xlii
<b>Annunciators.</b> Partrick & Carter. .... vii	<b>Builders' Hardware.</b> C. A. Strelinger & Co. .... iii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Furniture.</b> Cutting & De Laney ..... xlii
<b>Architects' and Surveyors' Supplies.</b> L. Manasse ..... iv	<b>Builders' Scroll Saw.</b> W. F. & J. Barnes Co. .... ii	<b>Door Hangers.</b> Lane Bros. .... xi	<b>Gang Lath Mill.</b> S. Adams & Sons. .... li
<b>Architects.</b> C. Powell Karr, C.E. .... iv	<b>Building Paper, Felt, Etc.</b> M. Ehret, Jr., & Co. .... cover iv Warren-Ehret Co. .... cover iii Warren Chemical and Mfg. Co. .... vii H. F. Watson ..... cover iii	<b>Drawing Instruments, Etc.</b> L. Manasse ..... iv	<b>Gas and Water Pipes.</b> Mellert Foundry & Machine Co. .... cover iii Pancoast & Rogers ..... viii Penna. Pipe Mfg. Co. .... cover iv
<b>Architectural Wood Turning.</b> Anderson & Dickey ..... iv Standard Wood Turning Co. .... iv	<b>Cabinet Woods and Veneers.</b> J. Rayner ..... i	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co. .... ii	<b>Gas Engines.</b> Economic Gas Engine Co. .... cover ii Williams & Orton Mfg. Co. .... ii
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.) ..... cover iii	<b>Cables.</b> Standard Underground Cable Co. .... i	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co. .... vii M. B. Swezey ..... ii	<b>Gas Fires.</b> H. P. Dixon & Co. .... cover iv
<b>Artistic Wood Decorations.</b> Buffalo Novelty Wood Turning Co. .... xii Cutting & De Laney ..... xii Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Carbolate of Lime.</b> M. Ehret, Jr., & Co. .... cover iv	<b>Eaves Trough and Gutters.</b> Hatten, Galpin & Co. .... ix	<b>Gas Machines.</b> Gilbert & Barker Mfg. Co. .... vi Tirrill Gas Machine Co. .... vi
<b>Artists' Materials.</b> A. H. Abbott & Co. .... i F. W. Devoe & Co. .... i	<b>Carpenters' Machinery.</b> Fred. A. Rich ..... v	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co. .... i	<b>Glass—Plate and Cylinder Window.</b> Cohansey Glass Mfg. Co. .... cover iii Hires & Co. .... cover ii Malaga Glass & Mfg. Co. .... cover iv Pittsburg Plate Glass Co. .... x P. Semmer Glass Co. .... vii Vanhorne, Griffen & Co. .... i
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr., & Co. .... cover iv Warren Chemical and Mfg. Co. .... vii	<b>Carpenters' Tools.</b> Stanley Rule and Level Co. .... cover ii Strelinger, C. A. & Co. .... iii John Wilkinson Co. .... xi	<b>Electric Lights.</b> The Thomson-Houston International Electric Co. .... cover iii	<b>Glass—Stained and Mosaic.</b> Beacon Stained Glass Works. .... cover iii Alfred Godwin. .... cover iv Hires & Co. .... cover ii Keystone Stained Glass Works. .... xii C. H. Postel & Co. .... cover iii William Reith ..... cover iii F. J. Riester ..... cover iii Tiffany Glass Co. .... vi
<b>Asbestos.</b> H. W. Johns Mfg. Co. .... x H. F. Watson ..... cover iii	<b>Carpet Lining.</b> Warren-Ehret Co. .... cover iii H. F. Watson ..... cover iii	<b>Electrical Supplies.</b> Partrick & Carter ..... vii Shaw & Geary ..... cover iv	<b>Greenhouse Boilers.</b> Hitchings & Co. .... cover ii New York Central Iron Works. .... cover iii
<b>Auger Bit Files.</b> C. A. Strelinger & Co. .... iii	<b>Cements.</b> H. W. Johns Mfg. Co. .... x M. Ehret, Jr., & Co. .... cover iv	<b>Elevators.</b> L. S. Graves & Son ..... v Henry H. Hill ..... v Howard Iron Works ..... v Morse, Williams & Co. .... ii	<b>Ground &amp; Rough Glass for Floors, Etc.</b> Pittsburg Plate Glass Co. .... x
<b>Automatic Heat Regulator.</b> The Guion Automatic Heat Regulating Co. .... ix	<b>Combination Dividers.</b> L. S. Starrett ..... vii	<b>Eliminator.</b> Hine & Robertson ..... vii	<b>Gymnastic Apparatus.</b> Narragansett Machine Co. .... xiv
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co. .... iv Anderson & Dickey ..... iv	<b>Contractor and Builder.</b> Allen B. Rorke. .... cover iii	<b>Engineers' Supplies.</b> L. Manasse ..... iv	<b>Gypsum Paint.</b> John Maxwell ..... iv
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts ..... iv	<b>Cordage.</b> Samson Cordage Works ..... cover ii	<b>Feed Water Heaters.</b> Stewart Heater Co. .... cover ii	<b>Hand Sawing Machines.</b> W. F. & J. Barnes Co. .... ii
<b>Bent and Beveled Glass.</b> Vanhorne, Griffen & Co. .... i	<b>Corrugated Iron for Roofing, Siding and Ceiling.</b> The Cincinnati Corrugating Co. .... ii W. G. Hyndman & Co. .... x N. S. Northrop ..... ii A. Northrop & Co. .... xlii Sykes Iron Roofing Co. .... iv Thompson Mfg. Co. .... ii	<b>Fire Apparatus.</b> Rumsey & Co. .... xi	
<b>Black Varnish.</b> M. Ehret, Jr., & Co. .... cover iv	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr., & Co. .... cover iv H. W. Johns Mfg. Co. .... x Shields & Brown ..... ix Western Mineral Wool Co. .... v	<b>Fire Brick.</b> Henry Maurer & Son ..... ix	
<b>Boiler Coverings.</b> M. Ehret, Jr., & Co. .... cover iv Shields & Brown ..... ix H. W. Johns Mfg. Co. .... x	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot ..... xiv	<b>Fireproof Building Materials.</b> Henry Maurer & Son ..... ix	
<b>Booksellers and Publishers.</b> Houghton, Mifflin & Co. .... vi J. B. Lippincott & Co. .... vi Ticknor & Co. .... vi John Wiley & Sons ..... vi	<b>Cutter Heads.</b> Sam'l J. Shimer & Sons ..... iv	<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co. .... xi Thompson Mfg. Co. .... ii	
<b>Brass Goods.</b> C. H. Besly & Co. .... ii		<b>Fireproofing Material.</b> H. W. Johns Mfg. Co. .... x H. F. Watson ..... cover iii	
<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.) ..... cover iii			



# PALACE KING —AND— PALACE QUEEN WARM AIR FURNACES.

SEND FOR CATALOGUE.

**RUSSEL WHEELER, SON & COMPANY,**  
UTICA, N. Y.



## CHILTON PAINTS.

{ The Chilton Manuf. Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application. }

147 Fulton St., New York.  
141 Milk Street, Boston.



## Band Saws. Band Saws.

**DAMASCUS TEMPERED BY NATURAL GAS  
HEAT, SUPERIOR TOUGHNESS.**

After more than ten years' experience in the manufacture of Band Saws, we have discovered a new process of **Tempering and Straightening** all at one operation. This process insures **absolute perfection**. We specially request all users of Band Saws to send us their address in full, and also a description of the sizes of saws used, and we will, by return mail, quote them special prices, and also send them our pamphlet on the Band Saw, which contains much valuable information for all users of Band Saws.

The Superior Quality of our Band Saws, All Tempered, Straightened, and Trued at one operation, which we have patented, makes them so perfect that our **SALES HAVE MORE THAN TREBLED IN THE PAST YEAR**. Our largest and best customers prefer them to the best imported saws.

**WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.**

## NATURAL GAS

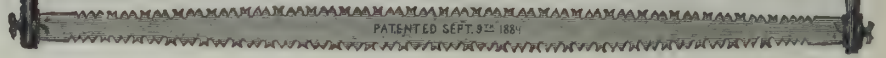
Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

## OUR CIRCULAR SAW

Of all sizes from 6 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

## Double Toothed Cross Cuts

(two saws in one), for all uses **HAVE NO EQUAL.**



Our SAWYER'S HANDBOOK will be sent **FREE** to any part of the world on receipt of full name and address.

Address **EMERSON, SMITH & CO. (LIMITED),**  
**Beaver Falls, Pa.**

## CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

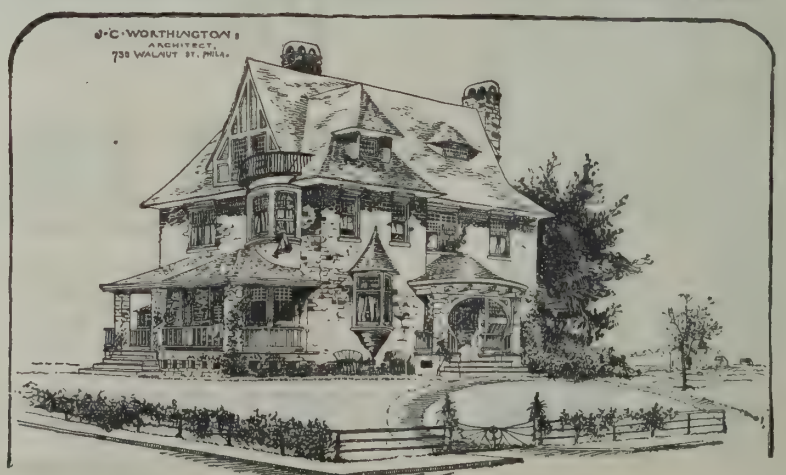
Page	Page	Page	Page
<b>Heating Apparatus</b>	<b>Office and Bank Fittings.</b>	<b>Roofing Paper, Etc.</b>	<b>Tools and Machinery for Oil Wells.</b>
Abram Cox Stove Co. .... cover iii	A. H. Andrews & Co. .... ix	M. Ehret, Jr., & Co. .... cover iv	Oil Well Supply Co. .... iii
Aldine Mfg. Co. .... ii	<b>Oil Well Supplies.</b>	H. W. Johns Mfg. Co. .... x	
Alsop Furnace and Stove Co. .... ix	Oil Well Supply Co. .... iii	The Standard Paint Co. .... cover iv	<b>Tools and Foot Power Machinery.</b>
Barstow Stove Co. .... viii	<b>Ornamental Brick.</b>	Warren-Ehret Co. .... cover iii	C. E. Little. .... ii
B. C. Bibb Stove Co. .... ix	Chicago Anderson Pressed Brick Co. .... xi	Warren Chemical & Mfg. Co. .... vii	Seneca Falls Mfg. Co. .... ii
Boydton Furnace Co. .... viii	Peerless Brick Co. .... xi	H. F. Watson. .... cover iii	
Broomell & Sanks. .... ix	<b>Ornamental Glass Work.</b>	<b>Roofing Slate.</b>	<b>Tower Ornaments, Finials, Etc.</b>
Danforth & Clark. .... cover iii	C. H. Postel & Co. .... cover iv	E. J. Johnson. .... vi	Thos. W. Jones. .... vi
Duplex Steam Heater Co. .... iv	The Western Sand Blast Co. .... ix	The Old Bangor Slate Co. .... vi	
E. N. Gates. .... ix	<b>Ornamental Rustic Work.</b>	<b>Roofing Tin.</b>	<b>Underground Cable.</b>
Globe Steam Heater Co. .... ix	John Wheeler. .... iv	Gumme, Sperring & Co. .... cover iv	Standard Underground Cable Co. .... i
Gurney Hot-Water Heater Co. .... iii	<b>Paints.</b>	N. & G. Taylor Co. .... cover iv	
H. Gilbert, Hart & Co. .... ix	The Chilton Mfg. Co. .... xiii	<b>Roofing and Wall Tiles.</b>	<b>Valves and Fire Hydrants.</b>
Howard Furnace Co. .... ix	F. W. Devoe & Co. .... i	Cortright Metal Roofing Co. .... xi	Mason Regulator Co. .... ii
Hitchings & Co. .... cover ii	S. H. French & Co. .... iii	The National Sheet-Metal Roofing Co. .... xi	Mellert Foundry & Machine Co. .... cover iii
E. A. Jackson & Bro. .... cover ii	H. W. Johns Mfg. Co. .... x	The Standard Paint Co. .... cover iv	Pancoat & Rogers. .... viii
Leibbrandt & McDowell Stove Co. .... i	The Standard Paint Co. .... cover iv	Thorn Shingle and Ornament Co. .... iii	<b>Varnish.</b>
National Hot Water Heater Co. .... vii	<b>Paneled Sheet Iron Ceiling.</b>	<b>Rustless Iron Water Pipe.</b>	F. W. Devoe & Co. .... i
New York Central Iron Works. .... cover iii	H. S. Northrop. .... ii	The Wells Rustless Iron Co. .... v	Standard Varnish Works. .... v
J. F. Pease Furnace Co. .... i	<b>Parchment Sheathing.</b>	<b>Sand Blast and Embossed Railroad Glass.</b>	<b>Ventilating and Exhaust Fans.</b>
Pierce, Butler & Pierce. .... cover iv	Hallett Bros. .... ii	The Western Sand Blast Co. .... ix	Geo. P. Clark. .... v
J. Reynolds & Son. .... ix	<b>Parquet Floors.</b>	<b>Sash Cord.</b>	<b>Wall Plaster.</b>
Richardson & Boydton Co. .... viii	J. Dunfee & Co. .... vii	Samson Cordage Works. .... cover ii	Adamant Mfg. Co. .... vii
Sisby Mfg. Co. .... ix	<b>Patents.</b>	<b>Sash Lock.</b>	<b>Water Heaters.</b>
The H. B. Smith Co. .... ix	Munn & Co. .... xi	Jenkins & Timby. .... iii	Instantaneous Water Heater Co. .... iv
B. F. Sturtevant. .... vii	<b>Pattern Makers' and Carvers' Tools.</b>	The Champion Safety Lock Co. ....	<b>Waterproof Parchment.</b>
Weston Engine Co. .... cover iv	C. A. Strelinger & Co. .... iii	<b>Saws.</b>	Hallett Bros. .... xii
R. Wheeler, Son & Co. .... xiii	<b>Photographic Outfits.</b>	American Saw Co. .... cover iii	<b>Weather Strips.</b>
Woodcock & Co. .... viii	E. & H. T. Anthony & Co. .... ii	Emerson, Smith & Co. .... xiv	J. Dunfee & Co. .... vii
	<b>Planing Mill Machinery.</b>	Seneca Falls Mfg. Co. .... ii	Richmond Weather Strip Co. .... v
	Hoyt & Bro. Mfg. Co. .... xii	<b>Scroll Saws and Tools.</b>	<b>Weather Vanes.</b>
	<b>Polished Plate Glass.</b>	W. F. & J. Barnes Co. .... ii	Thos. W. Jones. .... vi
	Pittsburgh Plate Glass Co. .... x	Seneca Falls Mfg. Co. .... ii	<b>Well Tools.</b>
	P. Semmer Glass Co. .... vii	<b>Shade Roller.</b>	American Well Works. .... ix
	Vanhorne, Griffen & Co. .... i	Cushman Bros. & Co. .... ii	<b>Window Guards and Gates.</b>
	<b>Porous Terra Cotta.</b>	<b>Shaking Grate.</b>	Composite Iron Works. .... cover ii
	Henry Maurer & Son. .... ix	Woodcock & Co. .... viii	<b>Window Sash Cord.</b>
	<b>Porous Earthenware.</b>	<b>Sheathing Lath.</b>	Samson Cordage Works. .... cover ii
	Henry Maurer & Son. .... ix	I. G. Jenkins. .... iii	<b>Wood Carpet.</b>
	<b>Portland Cement.</b>	<b>Shingle Stains.</b>	J. Dunfee & Co. .... vii
	Lesley & Trinkle. .... cover iv	Sam'l Cabot. .... xiv	<b>Wood Finishes.</b>
	<b>Poultry Yard Appliances.</b>	Dexter Bros. .... i	Bridgeport Wood Finishing Co. .... x
	S. S. Bent & Son. .... iv	<b>Shutter Worker.</b>	F. W. Devoe & Co. .... i
	<b>Prepared Roofing.</b>	F. B. Mallory. .... iii	Murphy & Co. .... i
	M. Ehret, Jr., & Co. .... cover iv	<b>Skylights.</b>	D. Rosenberg & Sons. .... v
	H. F. Watson. .... cover iii	G. Hayes. .... iv	<b>Wood Floors.</b>
	<b>Pressed Brick.</b>	<b>Slate Roofers' Supplies.</b>	Boughton & Terwilliger. .... iv
	Chicago Anderson Pressed Brick Co. .... xi	E. J. Johnson. .... vi	<b>Wood Mantels.</b>
	<b>Pumping Engines.</b>	<b>Sliding Blinds.</b>	Mankey Decorative Co. .... xii
	Economic Gas Engine Co. .... cover ii	Hartman & Durstine. .... x	<b>Woodworking Machinery.</b>
	<b>Pumps for all Purposes.</b>	Wm. Willer. .... x	F. H. Clement. .... i
	Rumsey & Co. .... xi	<b>Stable Fittings and Fixtures.</b>	J. O. Colladay & Co. .... xii
	<b>Recording Thermometer.</b>	S. S. Bent & Son. .... iv	Connell & Dengler. .... xii
	The Draper Mfg. Co. .... iv	<b>Steam Hot Blast Apparatus.</b>	The Egan Co. .... xii
		B. F. Sturtevant. ....	E. & F. Gleason. .... cover iv
		<b>Steam &amp; Hot Water Heating Engineers.</b>	Hoyt & Brother Co. .... xii
		Danforth & Clark. .... cover iii	C. B. Rogers & Co. .... iv
			Samuel J. Shimer & Sons. .... iv
			<b>Wrought Iron and Cement Lined Pipe.</b>
			Penna. Pipe Mfg. Co. .... cover iv

# A VALUABLE BOOK ON PHYSICAL CULTURE FREE ON APPLICATION.

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

NARRAGANSETT MACHINE CO.,  
55 Sprague Street, Providence, R. I.

## HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH CABOT'S CREOSOTE STAINS.



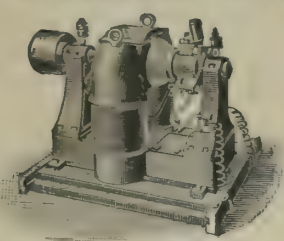
These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 30c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. Send for Samples on Wood, and Circulars.

SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.



# The Thomson-Houston Electric Motor.

ECONOMICAL,  
RELIABLE,  
DURABLE.

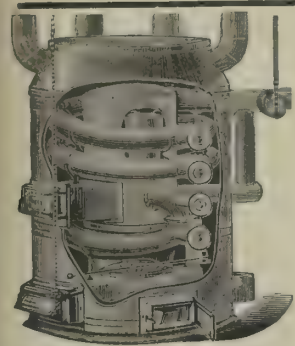


NO HEAT,  
NO DIRT,  
NO DANGER.

MOTOR

The Thomson-Houston Electric Motor is used for Machine Shops, Printing Offices, Carpenter Shops, Ventilating Machinery. Especially adapted to Elevators. For estimates address

**THOMSON-HOUSTON INTERNATIONAL ELECTRIC CO.,**  
**620 ATLANTIC AVENUE, BOSTON, MASS.**



THE  
Wrought-Steel or Cast-Iron Spiral Radiator and  
Portable Dome Furnaces,  
MANUFACTURED BY

**THE M. H. JACOBS FURNACE CO.,**  
SYRACUSE. NEW YORK.

For Warming City or Country Residences, Hotels, Stores, Churches  
and Public Buildings.

THESE FURNACES HAVE NO EQUAL.

"Cohansey" & "Bridgeton" BRANDS,  
Superior Packing and Sorting.  
Believed equal to MOST IMPORTED and superior  
to other American, for Builders, Sash Manufac-  
turers, Painters, and Florists.

**COHANSEY GLASS MFG. CO.,** 32 North Fourth St., PHILADELPHIA, PA.

## WINDOW GLASS.



**HARRISON CONVEYOR!**  
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.  
Send for Circulars. **BORDEN, SELLECK & CO.,** Sole Manu'rs, Chicago, Ill.

# AMERICAN SAW CO.

Trenton, N. J.

MANUFACTURERS OF  
Patent TOOTH and SOLID  
SAWS, GANGS, CROSS  
CUTS, MULAY, MILL, &c.  
"ALLIGATOR WRENCHES."

# SAWS

## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

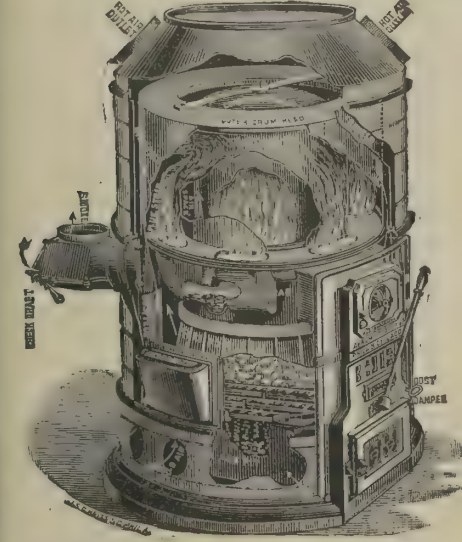
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



SOMETHING NEW:

### Model Novelty Range.

Economy in Space, Fuel, and Labor.  
No Brick Jambs or Lintel or Boiler Stand.  
Horizontal Hot Water Boiler on  
Top of Range.  
HOT AIR ATTACHMENT.  
MANY OTHER FEATURES.

Architects, Builders, and Owners should see and  
call for the above Specialties for Dwellings or  
Apartment Houses.

**ABRAM COX STOVE CO.,**  
PHILADELPHIA and CHICAGO,  
EXPERTS AND SPECIALISTS IN HOT AIR AND  
RANGE SUPPLIES.

NEW YORK AGENCY:  
**WILKINSON & BANTA,**  
250 WATER STREET.



# ART STAINED GLASS

For Churches & Dwellings  
Antique and Mosaic Work.  
Designs and Estimates on application.  
**William Reith,**  
134 N. 7th St., Philadelphia, Pa.



Cast Iron Pipe for Structural Work, Columns, etc.  
Flange Pipe and Specials.  
STOP VALVES, FIRE HYDRANTS, LAMP POSTS.  
**MELLERT FOUNDRY & MACHINE CO., Limited,**  
READING, PA.

# Art \* Metal Work

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

BRASS LAMPS FOR CHURCHES.  
BRASS WORK FOR CHURCH ALTARS.  
BRONZE GRILLES FOR DOORS.  
WINDOW RAILINGS.  
ORNAMENTAL LANTERNS.  
BRASS RAILINGS FOR BANKS.  
METAL SIGNS.

# STAINED GLASS

MEMORIAL, CHURCH,  
AND  
DOMESTIC WORK.

**C. H. POSTEL & CO.,**

Branch Office, 527 Arch Street.

1314 RIDGE AVE., PHILADELPHIA.

## STEAM and HOT WATER HEATING ENGINEERS

Correspondence Solicited.

**Danforth & Clark, Buffalo, N. Y.**

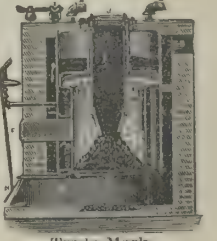


Manufacturer of Ecclesiastic and Domestic  
**ART STAINED GLASS,**  
**F. J. RIESTER, Prop'r, Buffalo, N. Y.**

## The Dunning Patent Wrought Iron Boiler. (Over 13 500 in use.)



THE Dunning Boiler, Self-Feeding, is the best for Low Pres-  
sure Steam Heating, and insures a warm house night and  
day. Free from Carbonic Acid Gas and Smoke. Made in  
eleven sizes, suitable to heat the smallest Cottage to the  
Largest Business Block, in five different styles:  
As a Magazine Boiler, which requires attention but once in  
twenty-four hours.  
As a Surface Burning Boiler, which will burn Hard or Soft  
Coal, Wood, Coke or Gas.  
As a Hot Water Boiler, for Green House and hot water  
heating.  
As a Portable Boiler, to be set without brickwork.  
Also in Two Sections, to pass through any door or window,  
where whole one cannot enter. Steam Engines and Boilers of  
all kinds and machinery generally. Manufactured at the  
**New York Central Iron Works, Geneva, N. Y., U.S.A.**  
LOCK BOX 40. Send for New Illustrated Catalogue.



Trade Mark.

# Contractor & Builder.

**ALLEN B. RORKE.**

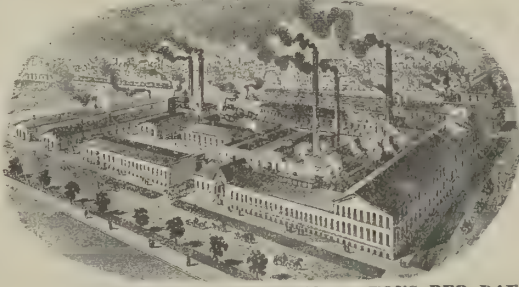
423 Walnut St.,  
PHILADELPHIA.

# KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

## BUILDING PAPERS.

ROSIN SIZED and  
WATERPROOF  
SHEATHINGS,  
DEADENING FELTS.  
PLAIN and  
CORRUGATED  
CARPET LININGS,  
ASBESTOS  
SHEATHINGS, Etc.



2 and 3 PLY  
PREPARED ROOFING,  
TARRED ROOFING  
FELTS,  
ROOFING  
MATERIALS,  
Etc., Etc.  
Send for Samples  
and Prices.

**ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.**

**H. F. WATSON, MFR., ERIE, PA.**

CHICAGO, ILL.,  
Office, 86 Washington St.

**NASHVILLE ROOFING & PAVING CO.,**  
Nashville, Tenn.

**LIBBY & WILLIAMS PAPER CO.,**  
St. Louis, Mo.

# Warren-Ehret Co., MANUFACTURERS OF ROOFING

OF ALL KINDS.

## BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc.  
Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

— WORKS: —

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you  
get the quality and brand wanted?

Because every PERFECT SHEET of the  
following three extra fine guaranteed  
brands of Roofing TIN IS STAMPED at  
the works with the name of the brand and  
the thickness. Please note this.

"Old Style." Extra Heavily Coated.  
The Best Made.

"Westminster." Re-dipped. Made  
from Heavy Iron.

COCKLEY Highest Grade of  
K Heavy Regular Coated.

EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and  
full information given.

**N. & G. TAYLOR CO.**

Established 1810. 79th year.  
**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



PHILADELPHIA,

423 Walnut Street.

ST. LOUIS,

113 North 8th Street.

CHICAGO,

50 Dearborn Street.

ANYBODY CAN PUT IT ON.  
EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY

**M. EHRET, Jr., & CO.,**

## THE "FLORIDA" HEATERS

TRADE MARK.

FOR STEAM HEATING.

16 Sizes—Magazine Feed for Hard Coal or Coke.  
16 Sizes—Surface Feed for Soft Coal, Wood or Gas.

For Hot Water Heating.

15 Sizes—Magazine or Surface Feed. Adapted to  
any fuel.

IN WARMING

**Suburban Homes**

The "Florida" has an established reputation. Its  
use insures uniform temperatures day and night.  
They are first-class in every respect, reliable, dur-  
able, and give best results in economical use of  
fuel, many thousands being in use. Descriptive  
book and references mailed free.

Address the Sole Manufacturers,

**Pierce, Butler & Pierce Mfg. Co.,**  
**SYRACUSE, N. Y.**

Estimates free. Satisfactory results guaranteed.

To "ARCHITECTS," "ROOFERS,"

AND THOSE THAT WANT FIRST-  
CLASS ROOF SPECIFY AND BUY THE

**OLD STANDARD BRANDS**

"Alderly." "Pennsylv" Old Method.

"Alderly."

"Pennsylv" Old Method.

"Alderly."

"Pennsylv" Old Method."

"Alderly."

"Pennsylv" Old Method.

The TWO BEST BRANDS GUARANTEED PLATES. NO BETTER MADE. HEAVIEST COATED. This has been proved by actual test.  
The 14x20 size contains 14 lbs. per Box Coating; the 28x20 contains 28 lbs. Coating.

Send for sample boxes. If not satisfactory, can be returned, our expense.

**GUMMEY, SPERING & CO., PHILADELPHIA.**



## YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,

SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**P&B**

IDEAL ROOFING,  
SHEATHING and INSULATING PAPERS.  
Electrical Compound, Tanners', Brewers',  
and Preservative Paints.

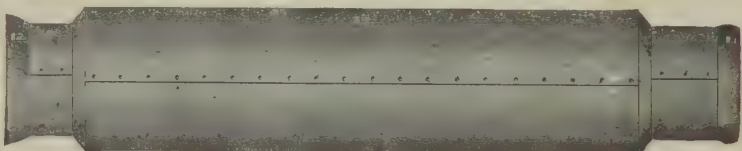


Please mention this paper

## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.



Pipe complete and ready for the trench.

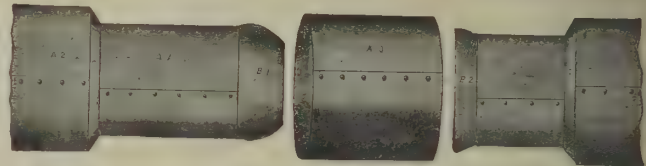
It is designed for

Public Works,

Public Buildings,

—AND—

Private Dwellings.



Wrought iron sleeve and the male and female ends before connecting for jointing.

MANUFACTURED BY THE

PENNSYLVANIA PIPE MANUFACTURING CO.,

Germantown Junction, Philadelphia, Pa.

## STAINED GLASS

For Churches and Private Dwellings, etc.

**JEWELLED MOSAICS.**

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WOOD

## WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.

## WINDOW GLASS.

Malaga Glass & Mfg. Co.

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

OFFICE.

MALAGA AND MILLVILLE, N. J.

400 CHESTNUT ST., PHILADELPHIA.



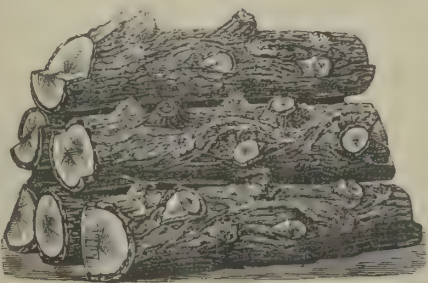
"GIANT" PORTLAND CEMENT,  
"EGYPT" PORTLAND CEMENT,  
"IMPROVED UNION" CEMENT,  
"UNION" CEMENT.

LESLEY & TRINKLE, Sales Agents, 216 South Third St., Phila.

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

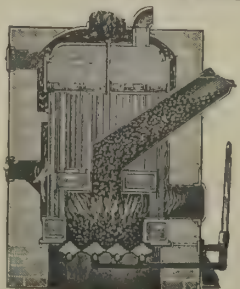
Manufacturers,

1330 Chestnut St., - Phila., Pa.

## SHAW & CEARY,

MANUFACTURERS & DEALERS

**ELECTRICAL APPLIANCES.**  
53 No. Seventh St., PHILADELPHIA.



## The BRONSON Improved MAGAZINE Base-Burning

STEAM HEATING BOILER.

For Steam and Hot Water Heating. Auto-  
matic and Reliable. With Brick or Iron  
Settings, as you may prefer. The Bronson  
is constructed on scientific principles, the  
fire surface being of the best boiler tubing  
that can be obtained. This boiler exposes  
more water to the direct action of the fire,  
either in steam or hot water heating, than  
any boiler made. We are making a  
specialty of a High Grade All-steel Boiler,  
which we are anxious to place by the side  
of anything in the world for actual results.  
Reliable Agents Wanted. Send for illus-  
trated Catalogue and Price List.

**WESTON ENGINE CO.,**

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sales Agents, 40 Cortlandt Street, New York.



## GEM SPRING HINGES

SINGLE

AND

DOUBLE

ACTING.



FOR

SCREEN,

MEDIUM

AND

HEAVY

DOORS.

The 3 and 4 inch are the best in the market for  
Screen Doors.

FOR DOORS.		Length of Flanges.		JAPANNED.			
				Single Acting.		Double Acting.	
Feet.	Inch.			Nos.	Per Pair.	Nos.	Per Pair.
6x2	1 1/4 to 1 3/4	3 1/2 in.	63	\$0.70	83	\$1.40	
7x2	1 1/4 to 1 3/4	4 in.	64	0.90	84	1.75	
7x2 1/2	1 1/4 to 1 3/4	5 in.	65	1.10	85	2.20	
7x2 1/2	1 1/4 to 1 3/4	6 in.	66	1.40	86	2.80	
8x2 1/2	1 1/4 to 1 3/4	7 in.	67	1.75	87	3.50	
8x3	1 1/4 to 1 3/4	8 in.	68	2.50	88	5.00	
9x3	1 1/4 to 1 3/4	10 in.	69	3.50	89	7.00	

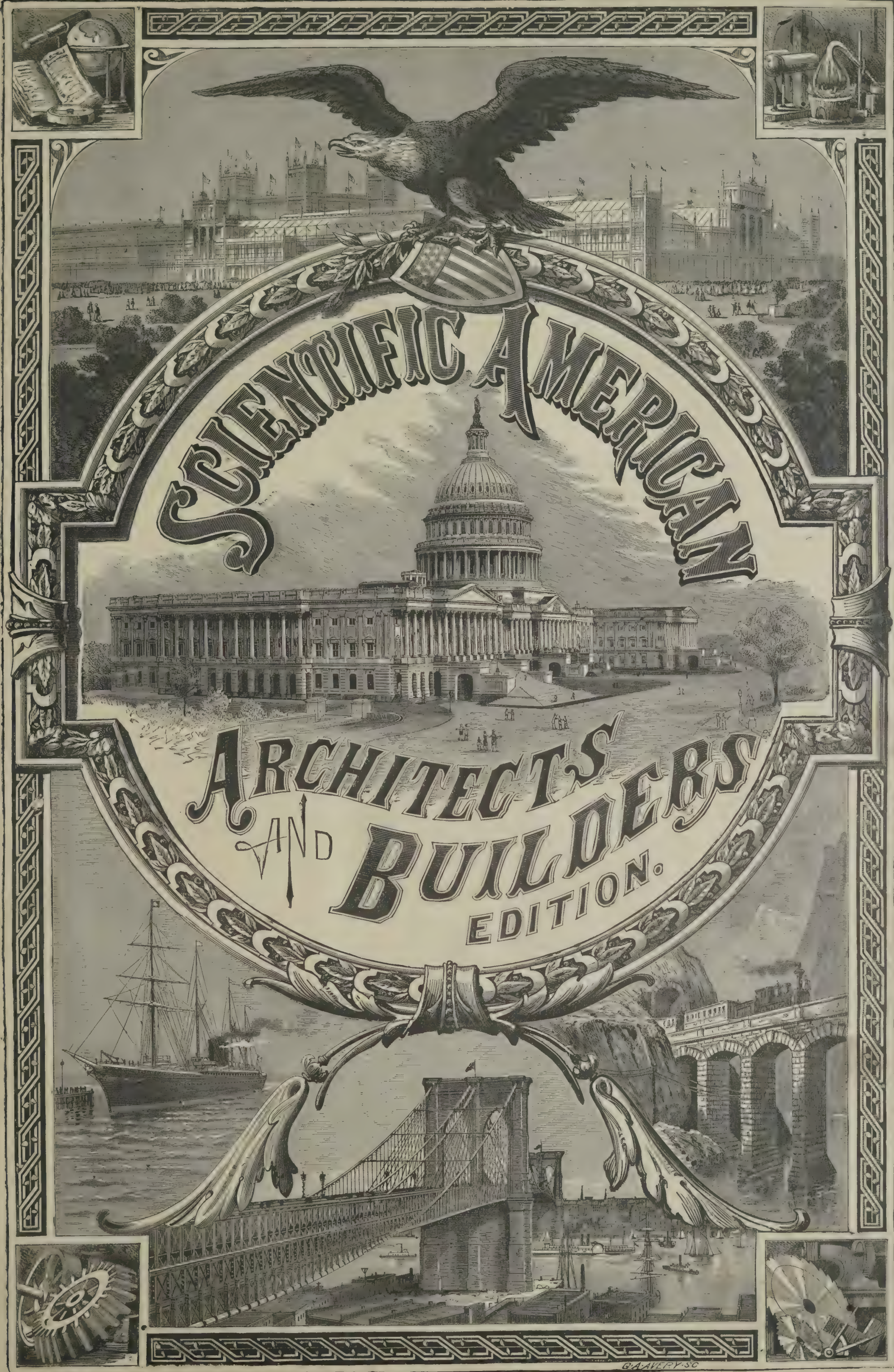
Send for full Catalogue of Bronzed, Brass,  
and Bronze Metal Spring Hinges.

MANUFACTURED BY

**VAN WAGONER & WILLIAMS CO.**

82 Beekman Street, New York.





COPYRIGHTED, 1888, BY MUNN & CO.

New York: Published by MUNN & CO., 361 Broadway, corner Franklin Street.

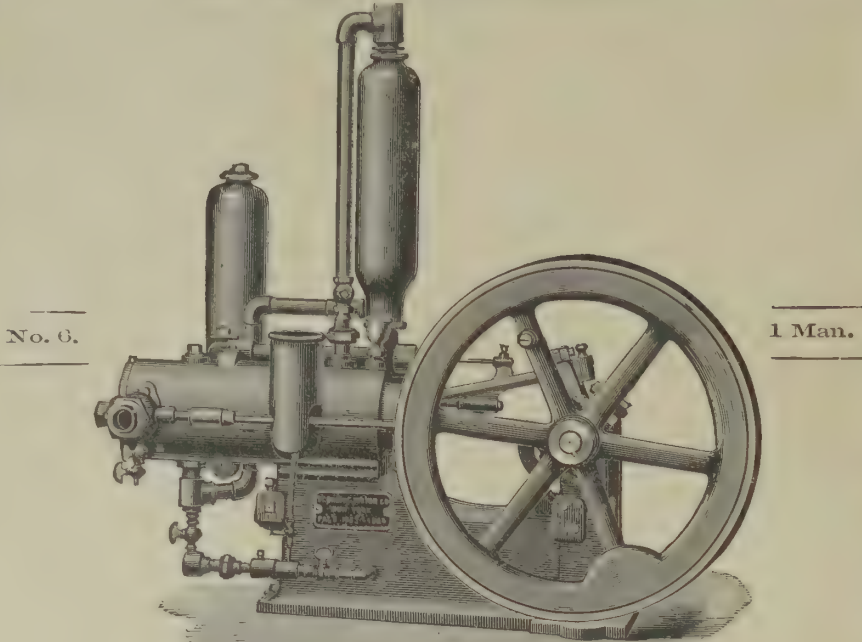


# ECONOMIC \* GAS \* ENGINES.

Best in principle, workmanship, and materials. An unequalled small Motor adapted to all uses. When the Motor is not at work, the expense of running it ceases. Simple, Safe, Economical, Durable. No extra Insurance required.

## PLUMBERS' GAS ENGINE.

Especially adapted for pumping water in Private and Apartment Houses, Flats, Small Hotels, and many other places.



Capacity 250 Gallons, 50 feet high, per hour.

## LARGER SIZES.

- No. 7. One-Half Horse, 600 Gallons, 50 feet High, per Hour.  
No. 8. One Horse, - 1,500 " " " "

## GASOLINE GAS ENGINES.

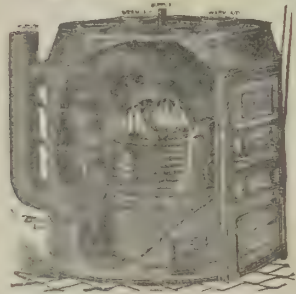
- No. 15. One Man, - 300 Gallons, 50 feet High, per Hour.  
No. 16. One-Half Horse, 600 " " " "  
No. 18. One Horse, - 1,500 " " " "

Four Sizes, from Motor for Sewing Machine or Dental Engine to One Horse Power. Our Gas Engines will work satisfactorily when attached to Gasoline Machines.

SEND FOR ILLUSTRATED CATALOGUE.

**Economic Gas Engine Co.,**  
Office and Salesroom, 34 DEY ST., NEW YORK.

## The Celebrated HOWARD FURNACES



An entirely original Furnace, with Howard's Patent Spherical Self-Dumping Anti-Clinker Grate. A Powerful and Economical Heater. Is made entirely of the best Cast Iron. Combination Warm Air and Hot Water Heater, with absolutely Gas-Tight joints. DO NOT buy a Furnace until you have SEEN and INVESTIGATED the merits of the Howard.

MANUFACTURED SOLELY BY  
**HOWARD FURNACE COMPANY,**  
Office and Warerooms,  
119 & 121 South Clinton St.,  
SYRACUSE, N. Y.



Are you building a new home? Make it beautiful.

**STAINED and LEADED GLASS.** For Public and Private Buildings. Send for Price List.

## BRAY'S PATENT GLASS MOSAIC

Is the handsomest, best and cheapest

STAINED GLASS!

and far superior to ordinary leaded glass for Door Panels, Transoms, Fire Screens, Hall Lanterns, &c., where fine artistic work is desired.

Illustrated Catalogue on application. | Beacon Stained Glass Works, 35 & 37 Province St., Boston, Mass.

Are you erecting a new church? Have it attractive.

## THE OTIS TUBULAR FEED WATER HEATER



With Seamless Brass Tubes and the most recent improvements. Specially adapted for utilizing the exhaust steam of

## ELEVATOR PUMPS,

both Passenger and Freight, to heat the Feed Water for the boilers.

We guarantee one square foot of heating surface per horse power.

We can give reference from Heaters already in operation under the same conditions, giving the best of satisfaction.

MANUFACTURED BY  
**Stewart Heater COMPANY,**  
40 & 42 Clinton Street,  
BUFFALO, N. Y.

**COMPOSITE IRON WORKS CO.**  
83 Reade Street, New York.  
Established 1847.

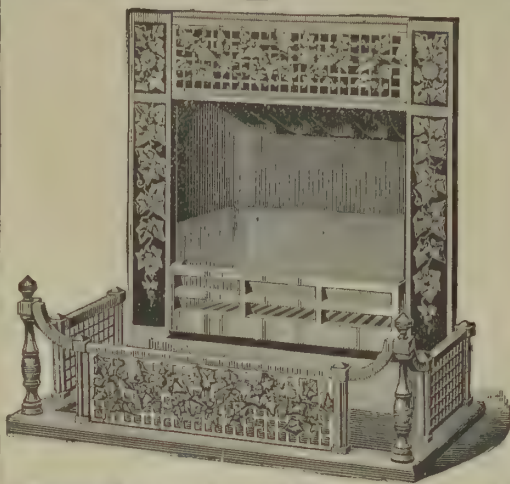


## Artistic Iron Work —FOR— BUILDINGS.

Patent Folding Gates and Guards for all purposes. A protection against the operations of Burglars and Tramps. Folded out of sight in day time. Iron and Brass Bedsteads for Hospitals, Institutions, and Private Dwellings.



# THE JACKSON Ventilating Grate & Fireplace Furnace



HEATING ON ONE OR TWO FLOORS  
200 DIFFERENT STYLES.

## NINETY

of these Grates ordered for the New Court House at St. Paul, Minn.

## SIXTY

in use in Columbia College, New York.

Send for Catalogue F.

**EDWIN A. JACKSON & BRO.,** 50 Beekman St., New York.

ARCHITECTS, BUILDERS!  
**ATTENTION IS CALLED TO**  
ADVERTISEMENT ON PAGE iii  
FRANK B. MALLORY.

## Wing's Disc Fans and High Speed Engines

Gold and Silver Medals taken over all other Fans. THE FAN BLADES ARE ADJUSTABLE, and being inside of a framework and made of the very best material, are perfectly safe.

The Engine is a great success, and the combination a valuable adjunct to Mills, Factories, Tanneries, Schools, etc., for drying, heating, cooling, ventilating, removing of steam, dust, etc. Fans, Belting, Engines, etc., at lowest rates. The Simonds Mfg. Co., 50 Cliff Street, N. Y. Send for Illustrated Circulars, Prices, etc.

## Solid Braided Cotton Sash Cord.

The "SAMSON" Window Line does not wear out. Save the annoyance of broken cords. Samples free on application to the manufacturers. Samson Cordage Works, 164 High St., Boston, Mass.

## SCHUMACHER

—AND—

## ETTLINGER,

## Lithographers,

32, 34 and 36 Bleecker

—AND—

311 Mott Streets,

NEW YORK.

## Fine Color Work!

A SPECIALTY.

**HIRES & CO., Limited,**  
MANUFACTURERS and IMPORTERS,

720 and 722 FILBERT ST., Philadelphia.

FRENCH PLATE  
AMERICAN "  
SILVERED "  
ROUGH "  
RIBBED "

**CLASS**

WINDOW  
PICTURE  
COLORED  
CATHEDRAL  
ORNAMENTAL

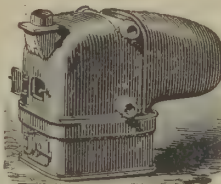
# Dwelling-Warming Hot-Water System.

**HITCHINGS & CO.,**

233 MERCER STREET, N. Y.

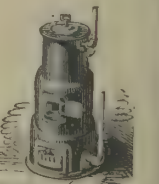
—ALSO—

## Greenhouse Heating and Ventilating Apparatus.



Estimates of cost furnished on application.

SEND 3 CENTS POSTAGE FOR ILLUSTRATED CATALOGUE.



**TANLEY'S ODD JOB**  
Seventy-Five Cent  
old by Hardware Dealer  
See one of these Tool



# SCIENTIFIC AMERICAN

Entered at the Post Office of

AND BUILDERS

New York as Second Class Matter.

ARCHITECTS

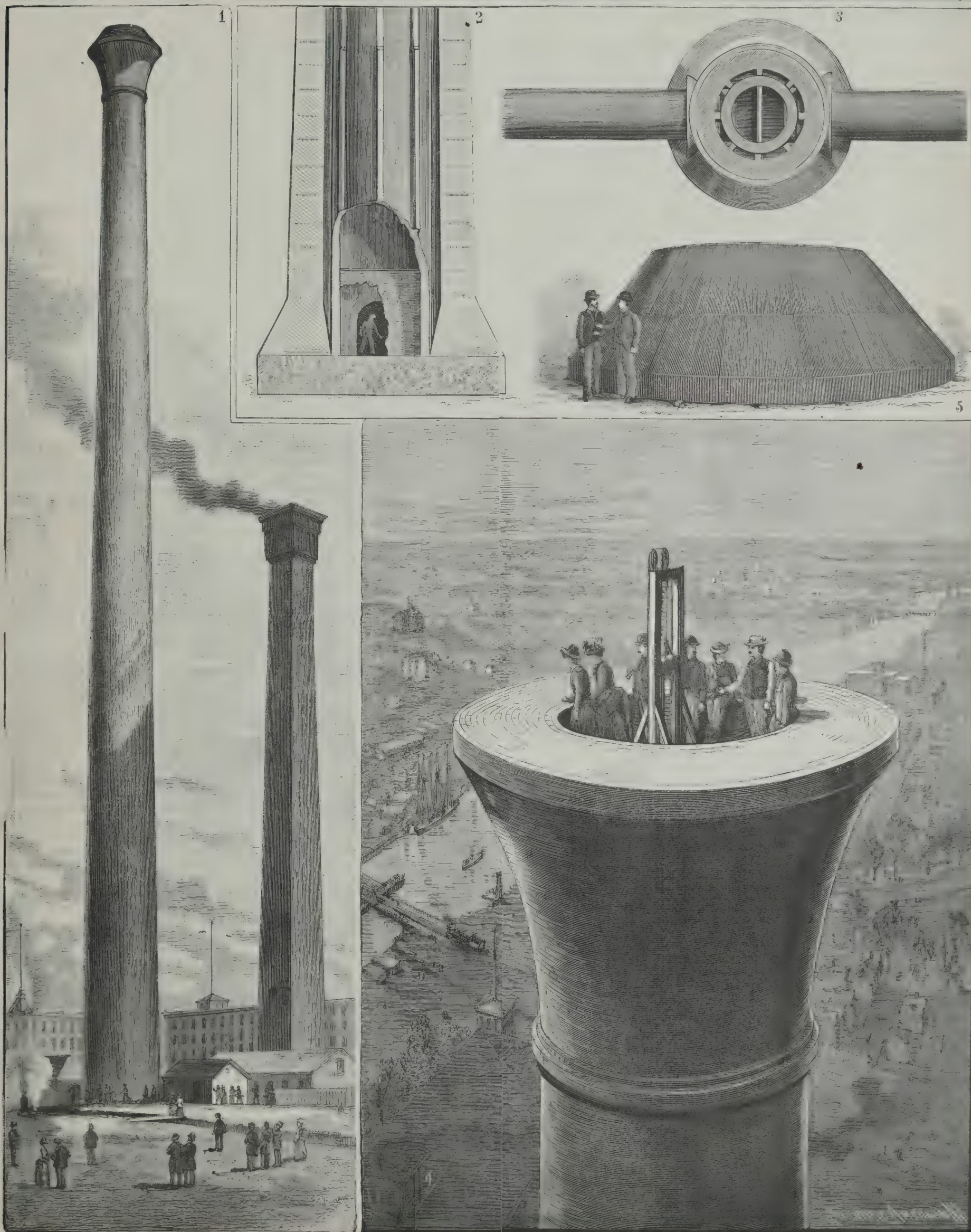
NEW YORK, DECEMBER, 1888.

EDITION.

Vol. VI. Subscription, \$2.50 a Year.

Single Copies, 25 Cents.

No. 6.



1. Old chimney, height 192 ft.; new chimney, height 335 ft. 2. Vertical section of chimney at base. 3. Horizontal section at level of ground. 4. General view of Newark and surrounding country from top. 5. Metal cap before being mounted.

THE NEW CHIMNEY OF THE CLARK THREAD WORKS, NEAR NEWARK, N. J.—THE HIGHEST CHIMNEY IN THIS COUNTRY.—[See page 105.]

PUBLISHED



# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,  
No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

NEW YORK, DECEMBER, 1888.

THE

## Scientific American,

ARCHITECTS AND BUILDERS EDITION.

\$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Specifications, Costs, etc.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

**Bound Volumes.**—Two volumes are published annually. Volumes 1, 2, 3, 4, 5 and 6, which include all the numbers of this work from commencement to close of 1888, may now be obtained at this office or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. These volumes contain all the colored plates, sheets of details, specifications, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,  
361 BROADWAY, NEW YORK.

We can supply at moderate cost the full plans, specifications, details, bills of materials, etc., ready for the builder, for any of the structures illustrated in this publication. We are assisted by a staff of able and experienced architects.

### CONCERNING AGENTS.

Customers who pay money to subscription agents or brokers do so at their own risk. Care should be taken to deal only with known, responsible, and reliable parties. We send no papers until we receive the subscription price; and no person is authorized to represent us, act for us, or receipt for us.

MUNN &amp; Co., Publishers, 361 Broadway, New York.

### CONTENTS

Of the December number of the ARCHITECTS AND BUILDERS EDITION of SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

Barn and carriage house*.....	119	Gift for Christmas and New Year's.....	104
Building, Drexel, Philadelphia.....	111	Heater, combination, the Howard*.....	122
Building, government, new, at Dayton, Ohio*.....	117	Heater, combination, warm air and hot water*.....	122
Cement, effect of adding sugar to.....	121	Heaters, hot water.....	122
Chimney, new, of the Clark Thread Works, Newark, N. J.*.....	103, 105	Houses, good looking.....	122
Church, heating and ventilation of.....	122	Pratt Institute, Brooklyn, N. Y.*.....	111
Cottage for \$4,300*.....	112, 121	Pratt Institute, view from rear playgrounds*.....	111
Cottage at East Orange*.....	113, 121	Residence at East Orange, N. J.*.....	115
Cottage at New Rochelle*.....	107, 121	Residence at Orange, N. J.*.....	116, 121
Cottage for \$1,500*.....	104, 109, 110	Residence for \$8,500*.....	106, 108
Court house and post office, new, at Abingdon, Va.*.....	117, 121	Residence new, of the Empress of Germany*.....	120
Designs, publication of.....	104	Residence, suburban*.....	118, 119
Details of cottages for \$1,500*.....	109	Sanitation, ancient.....	120
Details of village school house*.....	108	School house, village*.....	104, 108, 110
Facade of Milan Cathedral.....	121	Temperature in houses, automatic regulation of.....	122
Fireplace, Aldine.....	122	Thermostat*.....	122
Fireplace, Aldine, sectional view of.....	122	Thermostat connected to regulate furnace*.....	122
Floor plans, cottages for \$1,500*.....	110	Tin, roofing, old standard brands.....	122
Floor plans for cottages of moderate cost given in November number*.....	104, 120	Villa Reiss, near Cronberg, Taunus Mountains, Germany*.....	120
Floor plans of school house*.....	110	Villa, suburban.....	114
Foundry, Pratt Institute*.....	111	Waiter, dumb, New York safety*.....	122
		Year, close of another year.....	104

### COTTAGES FOR \$1,500.

One of our colored plates this month shows three designs for small cottage dwellings, for twenty-five foot lots.

The foundations are built of random rubble up to the water table. This forms a solid foundation for the plate, and above which is frame, the whole making a firm and substantial structure. There is one cellar. This is under the pantry, and is merely intended as a store, being fitted with an ice box.

The entrance is good and bold, with a 7' x 8' porch, giving plenty of space to cool off in, during the hot weather, or could be fitted with a shelf and nicely adorned with plants.

The parlor is 12' x 14', with a good bay window, giving the room a light and elegant appearance, and from which a good view can be obtained into the road. This we think is very desirable, especially for ventilation.

The living room is next the parlor, 12' x 13', from which we get a bed room 8' 6" x 12'.

The kitchen is 12' 6" x 18', lighted from either side. Pantry, 4' 6" x 6', and back entrance with porch completes the first story. The upper story has two good bed rooms, approached by an easy staircase.

On referring to the colored plate, it will be seen by the colors what is intended as a finish.

Roof, shingles, 18" long, 6 in. weather clapboarding.

Top panel in entrance door in square quarries.

Cathedral glass fixed in leaded light.

This plan, with slight modification, could be adapted for most sites. The estimated cost for these cottages is \$1,500 each. On page 109 we give various details, drawn to scale, by which they may be readily enlarged. On page 110 the floor plans are given.

### A VILLAGE SCHOOL HOUSE.

One of our colored plates for this issue illustrates a small school house. The object aimed at by the designer was simplicity and convenience.

The boys and girls have separate entrances, with a wardrobe for each.

The school room is in the center of the building, and is well lighted from both ends. The entrances are kept to one end, to keep the scholars during class as much as possible out of the way of all interruptions. There is a class room on each side of the school room, and connected by sliding doors, thus making, if desired, one large room.

We suggest for the foundations coursed or random rubble. This we show up to four feet above the floor level, and this would form a substantial base for the superstructure.

The colored plate will show the outside finish, cement in gable end and tiled or slate roof. The interior finish could be of white pine or poplar, according to the expense in the particular locality.

We think this a timely opportunity for making a few remarks upon what we consider the most essential feature to be kept in view by a designer in school house work, and which frequently gets very little attention. This is ventilation.

G. W. Rafir, C.E., was employed in 1877 by the Board of Health of the city of Rochester, N. Y., to make an examination of the school ventilation in that city. He then made a table fixing the amount of air supplied to scholars of the different grades, increasing from fourteen feet per minute for the ninth grade to thirty-three feet per minute for the first grade.

Mr. Arthur Walworth, of the Walworth Manufacturing Co., states that the largest amount of air per minute which they ever figured on in computing their heating plants for school houses is twenty feet, and that in reality the supply of air rarely reaches ten or twelve feet per minute.

Lowell school, Boston, built previous to 1884, tested in fall of 1885, the supply of air was found to be only five feet per minute per scholar, and, in the opinion of the manager of the New York Exhaust and Ventilator Co., the ventilation in this school is as good as that in the average schools throughout the Eastern States, and much superior to New York City.

It is very essential to have a fan in ventilating even the smallest school houses, as any system which depends only upon the difference in density of the air in the room and of the exterior air at the top of the building, to produce the necessary current, cannot work satisfactorily at all seasons of the year, especially in weather when the external temperature is between fifty and sixty.

The estimated cost of this school house is \$3,000. On page 108 we give various details, which can be readily enlarged to required size as per scale. On page 110 we give the floor plan.

### TWO COTTAGES OF MODERATE COST.

In our last number (November) we gave in our colored plate the elevations of two cottages of moderate cost; also description, page 86; and on page 89 of same number we gave sundry details for same. In our present issue, page 120, we give the floor plans for the same cottages.

### CLOSE OF ANOTHER YEAR.

The present number closes our sixth volume, and brings us to the end of another year. Many subscriptions now terminate, and we ask our patrons to be prompt in sending their renewals; thus avoiding the loss of any numbers. The terms are only \$2.50 a year.

Considering the wealth of illustration, the variety and value of information presented, this work is by far the cheapest of anything in the same line.

To builders and those contemplating the erection of dwellings or other structures, our paper has proved to be of great value.

With every number during the past two years we have given plates in colors of many new buildings, with specifications, plans, and details. In most cases these have been so complete as to enable the builder and contractor to proceed at once with the construction; and on the plans thus presented, thousands of new buildings have been erected in all parts of the country. In almost every town in the land attractive dwellings are now to be seen, which, on inquiry, will be found to have been built from SCIENTIFIC AMERICAN plans.

No architectural publication in the world presents to its patrons so many practical drawings without cost except the merely nominal subscription rate of \$2.50 a year. It is hardly necessary to remind the builder that he would be obliged to pay several hundred dollars if the same number of plans were to be specially prepared for him.

In addition to the colored plates, and details, we have furnished a large number of other new architectural illustrations and many pages of valuable information. In all, the past year's volumes include about one thousand engravings.

We remind our readers of these items with the hope they will mention them to their friends, and if possible to secure a new subscription, to send it in with the renewal of their own.

Our aim is to improve and enlarge the sphere of work, rendering it more and more valuable. To this end we need the support and encouragement of as many subscribers as possible. If each one of our friends will do a little for us in this direction, all the parties concerned will derive benefit.

If any of our readers have inquiries to be answered, or suggestions to make, relating to subjects or features they would like to see treated in our paper, we shall, at all times, be pleased to hear from them.

Architects and builders who desire to see their plans reproduced in our pages are also invited to communicate with the editor.

### A GIFT FOR CHRISTMAS AND NEW YEAR'S.

As a gift for Christmas or New Year's, what could be more appropriate, or more likely to be highly appreciated as a present to relative or friend, than a year's subscription to the SCIENTIFIC AMERICAN, ARCHITECTS AND BUILDERS EDITION.

The beautiful style of this publication, its elegant illustrations, the varied, interesting, and useful nature of its contents, combine to render it desirable and welcome to every one.

### Publication of Designs.

There appears to be a difference of opinion among architects as to whether it pays to furnish their designs for publication in architectural journals. It can be proved easily enough that it does pay, and pays well, if the designs have merit in them. With the designs of most buildings, especially of residences, floor plans are of very great importance to those who contemplate building. A sensible client rarely ever undertakes to tell his architect how he wants his building to look from the outside. The plans are first; elevations follow. Several years ago the writer sent to a building journal the plans and elevations for a small cottage. The editor at once wrote that he would publish them all, if specifications and an estimate of cost were furnished, and these were prepared and sent to the journal. Within a year this one publication brought the writer over one thousand dollars' worth of work from a single Western city, not one of whose citizens he knew then or knows to this day. Within three years he was paid for thirteen sets of working drawings of this cottage design, the orders coming from several different States. Again, he made a sketch for a store front which was rejected, and a second one made by himself, and which he considered much inferior, was accepted. The first was sent to an architectural paper, and was soon after published. Four years afterward a wealthy merchant in a distant city had received some sketches for quite a large building he was about to erect, but they were not satisfactory. One day, as he was discussing his project and wishing that he could see something different from what he had seen, and what his own architects had sketched for him, a young lady, hearing his discussion, volunteered to show him a design that she thought would please him. It was the writer's rejected sketch. A brief correspondence followed, and the commission was soon let, and with it came a goodly sum of money, with much other business. At another time we published some designs in another journal.



and we have had the pleasure of hearing from them from Riverside, Cal.; Port Townsend, W. T.; Oregon City, Oregon; and from cities in Massachusetts, Pennsylvania, Kansas, Iowa, Dakota, Connecticut, New Jersey, and Canada, not to mention many cities and villages near home. But a pretty perspective, especially if of a residence, will not alone accomplish such results. There must be plans. One of the most famous English architects, who was a great sketcher and a fine pen and ink draughtsman, always made plans of the important buildings that he sketched, and the plans always accompanied his own works when published. Some may fear that they are giving away a good thing. If so, we can only say: Make a better one next time. We notice that those that give away get

There is a cemented cellar under whole of the house, with furnace and laundry rooms, the latter with neatly fitted wash trays, with hot and cold water.

The entrance is by a vestibule, which is a protection against the weather, and at the side of same there is a pleasant nook, with a spindle arch over, and seats.

The principal rooms on first floor are separated with sliding doors and are provided with pleasant open fireplaces, with neatly laid tiled hearths and handsome mantels of hardwood. The door and window casings are all neatly beaded, and carved corner blocks are at angles.

The hall is finished in oak, and the grand staircase starts at center of hall and has a landing, with windows glazed with stained glass. The newels are handsomely

#### THE GREAT CHIMNEY AT THE CLARK THREAD WORKS, KEARNEY, N. J., HEIGHT 335 FEET.

We illustrate in this issue the great chimney recently erected at Kearney, near Newark, N. J., by the Clark Thread Co. It possesses the distinction of being the tallest chimney in America, and the fourth tallest in the world. It presents a most graceful appearance, and forms an impressive feature of the town. The ground on which it stands is on the eastern bank of the Passaic River, a rather low, flat area, so that the chimney bears somewhat the same relation to Newark that the Washington monument does to Washington. The latter structure is the only one in America that can dwarf it.

The shaft is circular, and rises with a perfectly uni-



A RESIDENCE FOR \$8,500.

large returns.—N. W. Builder, Decorator and Furnisher.

#### A RESIDENCE FOR \$8,500.

We illustrate an attractive residence built for Mr. Hoey, at East Orange, New Jersey, at a cost of \$8,500.

Our engraving was made direct from a photograph of the building, taken especially for the SCIENTIFIC AMERICAN.

The exterior of this house is pleasing, and the different materials are combined in a tasteful manner. The piazza at front, the circular bay at corner rising into a tower, and the bay at side, with the balcony, are all excellent features. The first story is covered with beveled white pine clapboarding; the second story and gables shingled, some of which are cut circular, all painted light yellow, with dark brown trimmings. The roof is covered with octagonal cut slates.

carved, while the posts, balusters, and rail are neatly turned. Drawing room and sitting room are finished in cherry. The dining room is finished in oak, same as hall, all neatly finished in the natural wood and highly polished.

The kitchen and its apartments are complete in all appointments. The servants' hall has stairs to cellar and second floor, with newels, balusters, and rail all neatly turned out of whitewood finished in the natural.

On the second floor there are five bed rooms, well lighted, provided with ample closets. Two of the rooms are furnished with open fireplaces.

One bed room is finished in white and gold, one in oak, others in cherry. The bath room is provided with all the latest improvements.

Three rooms are finished off in attic, besides a trunk room and ample space for storage. The ceilings are neatly corniced.

form batter from the bottom to the neck below the cap. Its diameter at the base is 28 feet 6 inches, and at the neck is 14 feet. This gives a batter of 7 feet 3 inches, or 2.85 inches for every ten feet. Its total height is 335 feet. Its internal diameter is 11 feet, giving one circular flue. At the summit it expands into a well proportioned capital surmounted by a cast iron coping. The latter weighs six tons, and is composed of thirty-two sections. They are bolted together by inside flanges, so as to present a smooth exterior.

The foundation is in concrete. The ground was excavated until a layer of firm gravel was reached, one foot below the water. Upon this the concrete was deposited. It was composed of crushed limestone 6 parts, sand 3 parts, and German Portland cement 1 part. It is 40 feet square and 5 feet deep, forming a block of 8,000 cubic feet volume, and weighing about one million pounds.



On this the base was started, composed, like the shaft proper, of brick laid in cement mortar. For this portion, up to four feet above the ground, a mixture of 1½ parts sand to 1 part German Portland cement was used for the mortar. The shaft up to a height of 160 feet is laid with the following mixture: Sand 6 parts, lime 2 parts, and cement 1 part. The sand and lime were made into mortar and had stood three months before use. This method of treatment is considered to improve the quality of mortar. Just before use the cement was added. From this point up the proportion of cement was increased until, at the top, the proportions became: Sand 3 parts, lime 1 part, and cement 1 part.

Two qualities of brick were used. The outer portions were of the first quality North River, and the backing up was of good quality New Jersey brick.

Every twenty feet in vertical measurement an iron ring, 4 in. wide and ¾ to 1 inch thick, placed edge-wise, was built into the walls, about 8 inches from the outer circle.

As it starts from the base the chimney is double. The outer wall is 5 feet 2 inches in thickness, and inside of this is a second wall 20 inches thick and spaced

as owing to the great height of the chimney, a comparatively slight heat in the products of combustion will generate ample draught. The advantage, in an engineering sense, of so large a chimney will be derived from this factor of economy.

Twenty-one boilers of 200 horse power each will depend upon the great chimney.

The general methods of construction adopted were characterized by simplicity as well as by efficiency. A steam elevator, with a platform 8 feet 6 inches by 3 feet, was arranged to run up and down inside the shaft. It had 3,000 lb. capacity, but never had to raise more than 800 lb. Two uprights, 4 × 6 inches, were braced against the inside walls and served as guides to the elevator. As the work progressed these and other fixtures of the elevator were carried up until finally the crane, carrying the main sheave, was above the coping nearly 340 feet from the earth. Interior scaffolds were built every few feet as the work progressed; two beams, 3 × 8 inches, being built into the walls to carry each one.

The greater part of the main shaft and lining was executed by eight bricklayers and five helpers. Their material was supplied from below by seven laborers on

The total weight of the chimney is put at 5,000 tons, divided as follows:

Brickwork.....	9,051,899 lb.
Concrete.....	1,000,000 lb.
Ironwork.....	40,000 lb.
Total.....	10,091,899 lb.

The bearing surface is 1,600 square feet giving about 2.8 gross tons per square foot, or, more exactly, 6.312 lb. The total number of bricks in the stack is 1,697,231; 201,000 were used in the base and foundation, and 66,277 in the caps.

No means are provided for ascending the chimney after the elevator is removed. Should it become necessary to do so, a balloon with a line can be sent up through the central flue and allowed to lose its gas and descend on the outside. This will provide means for drawing up a line of sufficient size to enable a man to ascend the shaft.

The Clark chimney was erected by the company, under the superintendence of their foreman, Mr. Cunningham. It cost \$30,000. From the point of view of architectural beauty, as well as perfection of structural features, too much credit cannot be awarded to all concerned in its erection. The builders have allowed



A RESIDENCE FOR \$8,500.

[For description see page 105.]

off about 20 inches from main wall, and, of course, concentric with it. From the interior surface of the main wall eight buttresses are carried, nearly touching this inner or main flue wall, in order to keep it in line should it sag. The interior wall, starting with the thickness described, is gradually reduced until a height of about ninety feet is reached, when it is diminished to 8 inches. At 165 feet it ceases, and the rest of the chimney is without lining; no fire bricks are used in the lining.

As the chimney receives two horizontal flues placed diametrically opposite to each other, a 12 inch deflecting wall is built across the vertical shaft, starting from the base and rising 16 feet. The plane of this wall is perpendicular to the axis of the flues.

The two flues just alluded to are arched tunnels 7 feet wide and 8 feet high. An arched opening is formed for their entrance into the chimney, and a space of two inches is provided between the outside of the flue and the main structure. The walls of the horizontal flue as they enter the stack are 16 inches in thickness.

In these flues it is proposed to place feed water heaters for the boilers. About one thousand pipes will be included in them. It is believed that much more of the waste heat can thus be economized than is usual,

the ground. A system of bell and flag signals was arranged, so that no confusion could exist, and the men below could tell at once what material to send up in the elevator.

Two operations were needed to keep the chimney true. The circle had constantly to be verified or trained. By accurate plumbing a series of center points were carried up, one being established at every forty feet of height. From the line of those representing the axis of the shaft the training was done. The other operation was the plumbing. The batter or slope being a constant, a mason's plumb rule was planed off to give the true slope, and the sides were constantly tried with this. Both these operations were in charge of one man, who constantly was training or plumbing. By many hours of practice he acquired the art so perfectly that he never looked to the ground, his eye not ranging below the end of his rule.

Eventually the chimney was plumbed from a height of 300 feet, a forty-foot plumb bob being used. The deviation from the vertical was practically imperceptible.

Altogether 150 days of 9 hours each were devoted to the construction—a remarkably short period for so great a work.

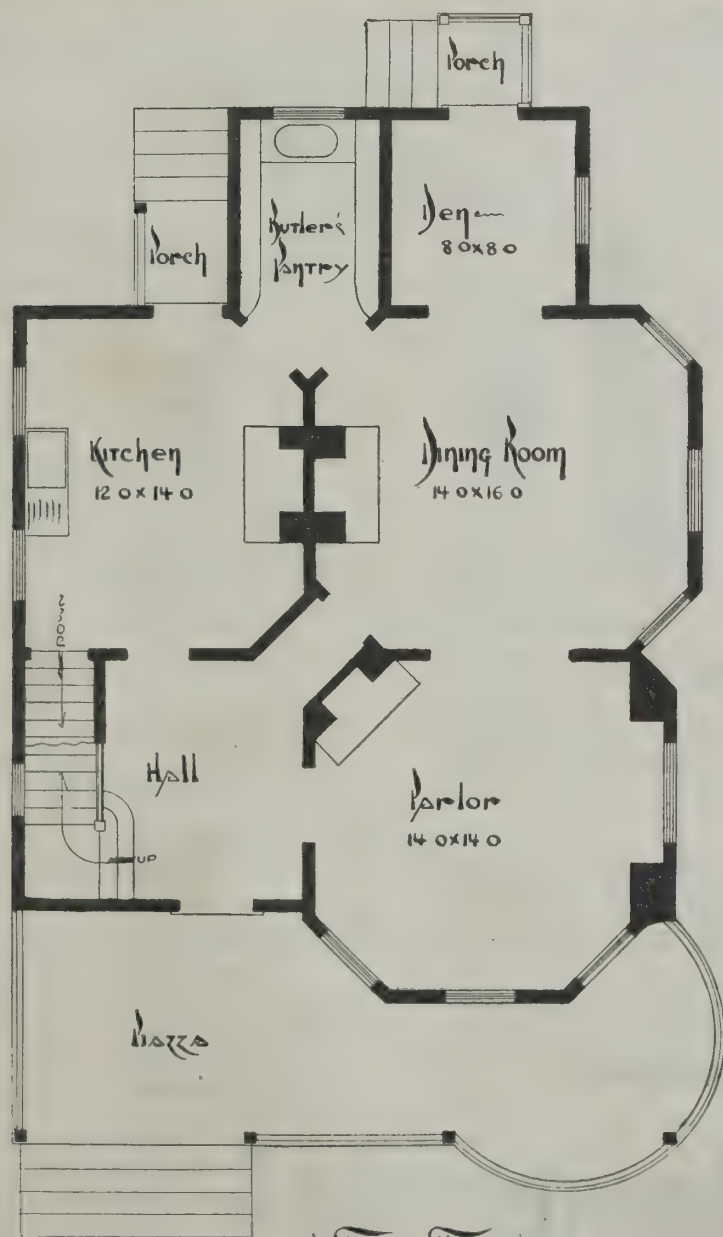
for about six inches of sway, which is about the amount of motion anticipated during a violent blow.

We append some dimensions of three chimneys that exceed this one in height: Townsend's chimney, Glasgow, Scotland—height, from ground to coping, 454 feet. Tennant & Co's chimney, Glasgow, Scotland—height, from ground to coping, 435 feet 6 inches. Dobson & Barlow's chimney, Bolton, England—height, from ground to coping, 367 feet 6 inches.

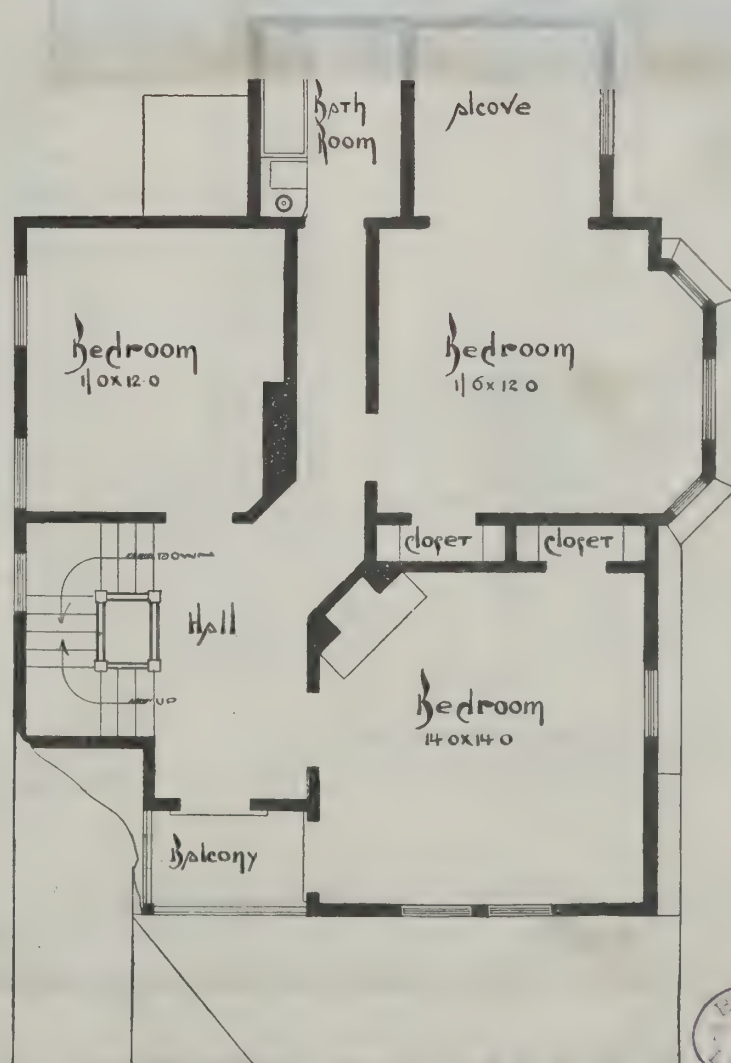
IN connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Munn & Co., 361 Broadway, New York.





\* First Floor



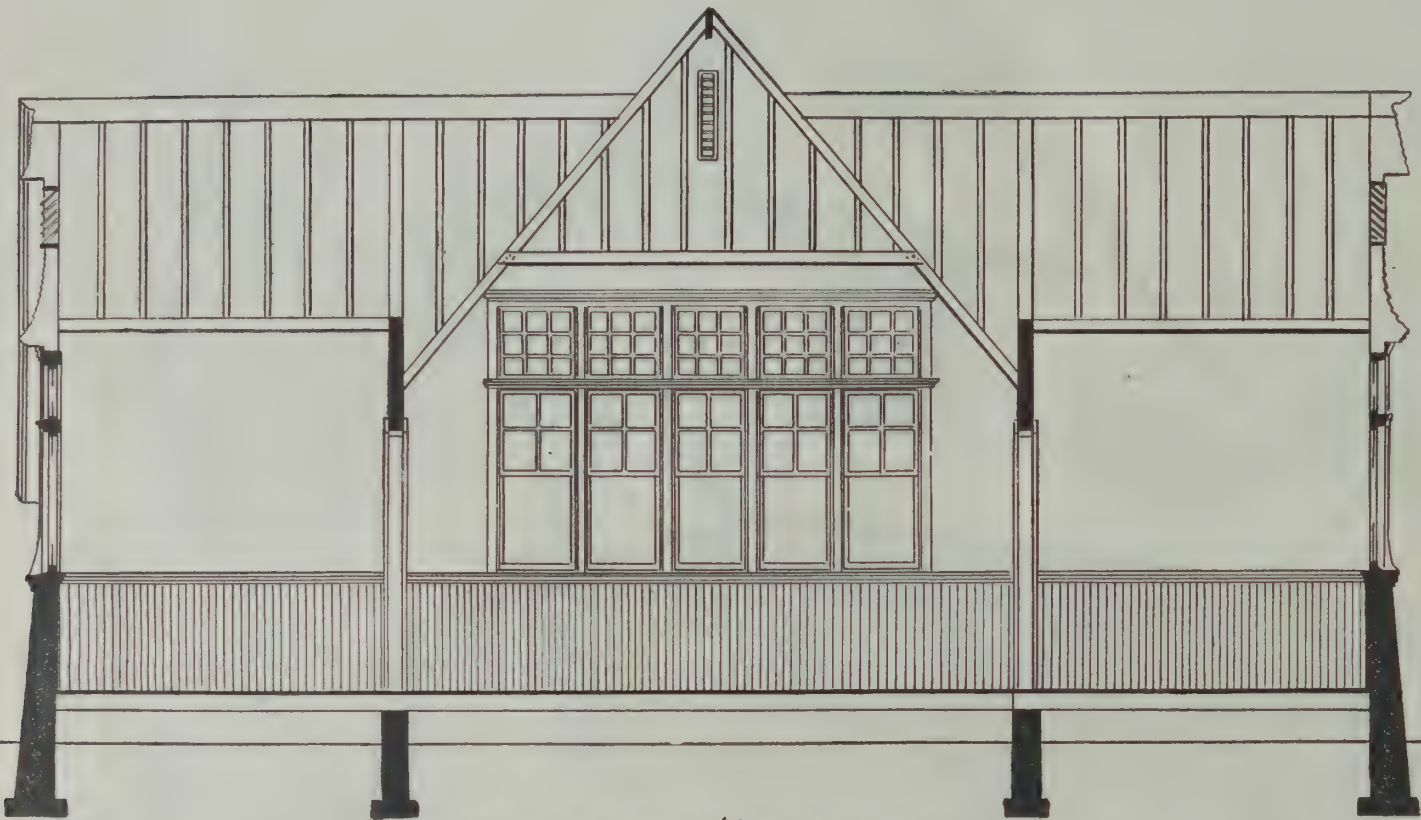
\* Second Floor

A COTTAGE AT NEW ROCHELLE.

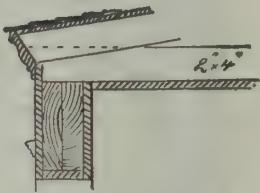
[For description see page 121.]



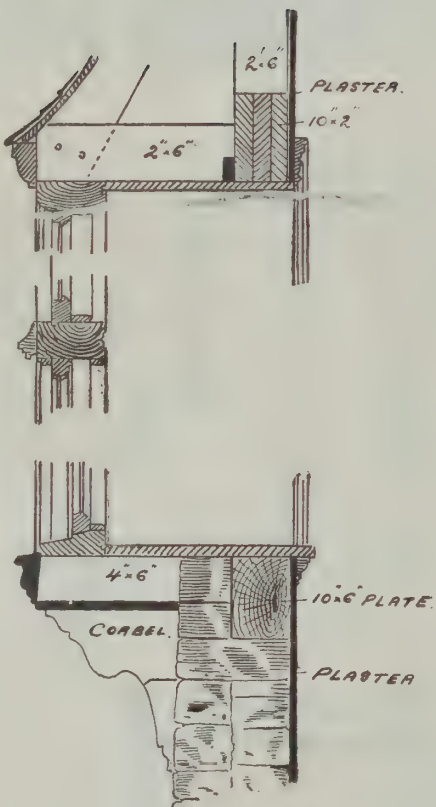
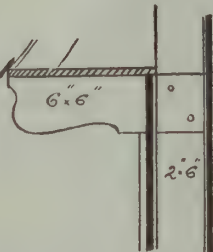




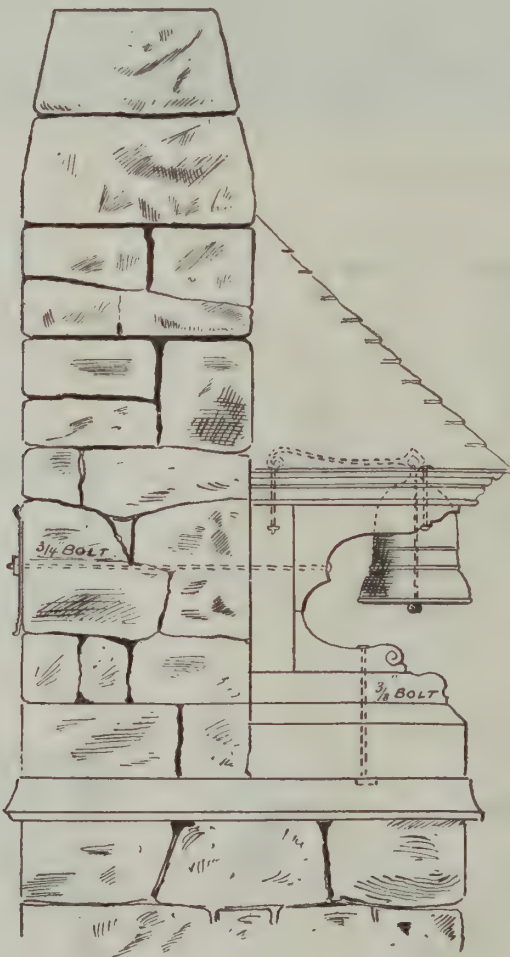
SECTION THRO' HOUSE. SCALE A.



SECTION (PORCH) C.D.

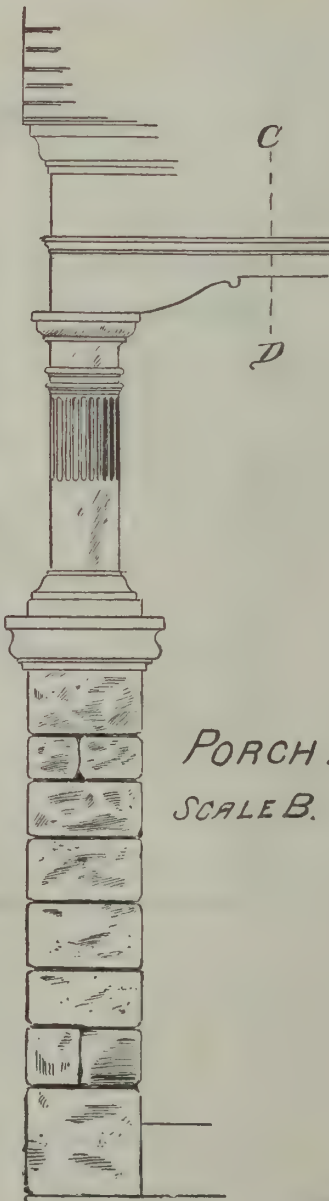


SECTION THRO' BAY WINDOW  
SCALE B



CHIMNEY AND BELL-COTE.  
SCALE B.

VERTICAL SECTION  
SCALE B



PORCH.  
SCALE B.

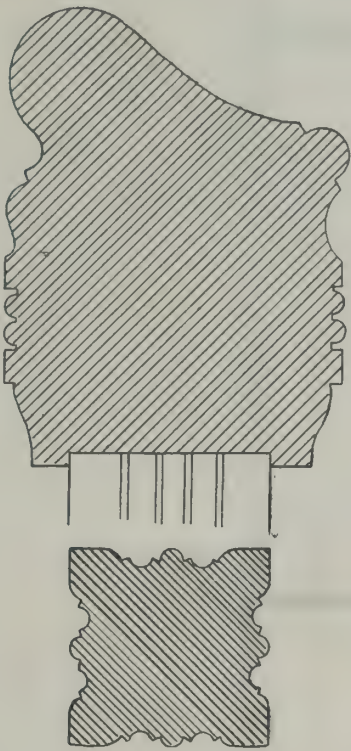
SCALE A. 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 FEET

SCALE B. 0 1 2 3 4 5 6 7 FEET

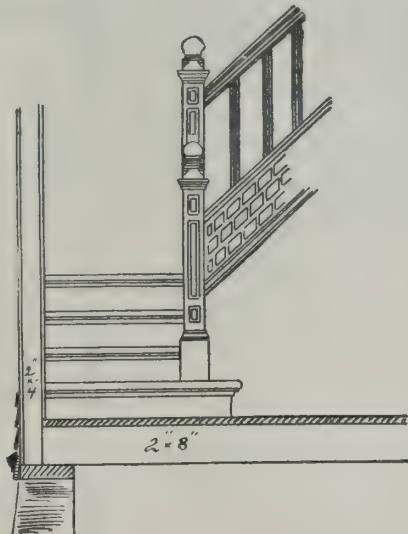
# A Village School House.







HAND RAIL <sup>3</sup>/<sub>4</sub> BALUSTER.  
SCALE C.



ELEVATION OF STAIRS  
SCALE B



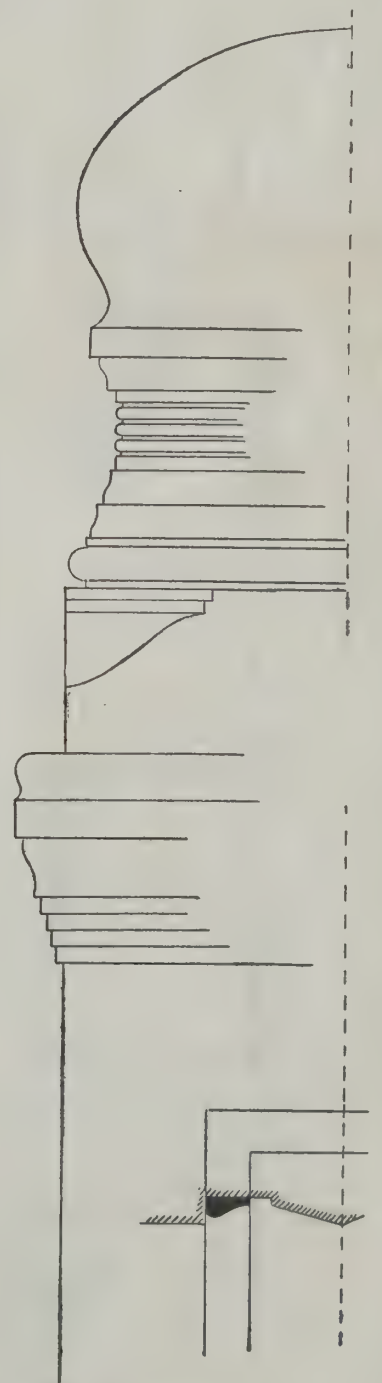
SECTION THROUGH HALL <sup>3</sup>/<sub>4</sub> PARLOR. SCALE A.



ELEVATION OF PORCH. SCALE B



SECTION OF SUBBASE  
SCALE C.



NEWEL, SCALE C.

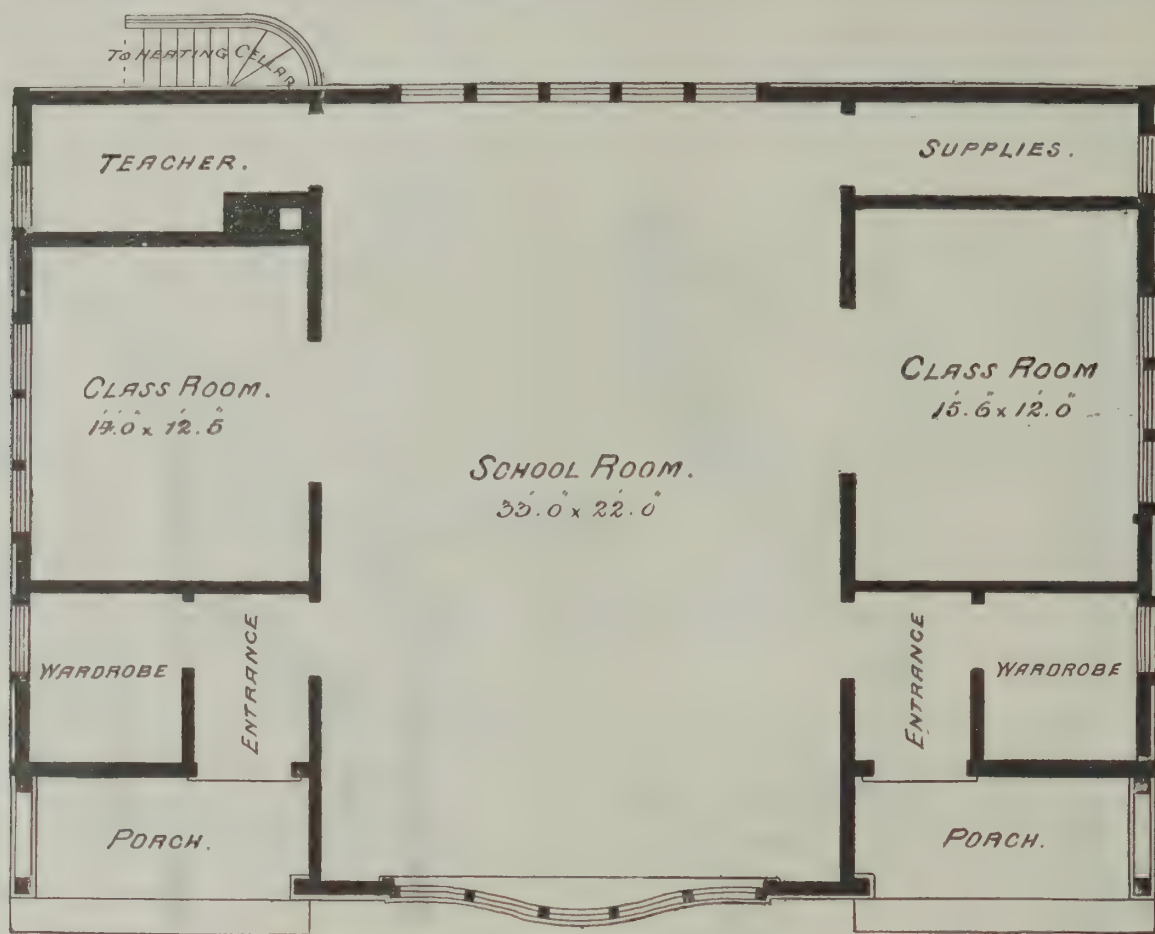
SCALE A 0 1 2 3 4 5 6 7 8 9 10 FEET

SCALE B 0 1 2 3 4 5 6 7 8 9 10 FEET

SCALE C 0 1 2 3 4 5 6 7 INCHES

Cottages for \$1,500.

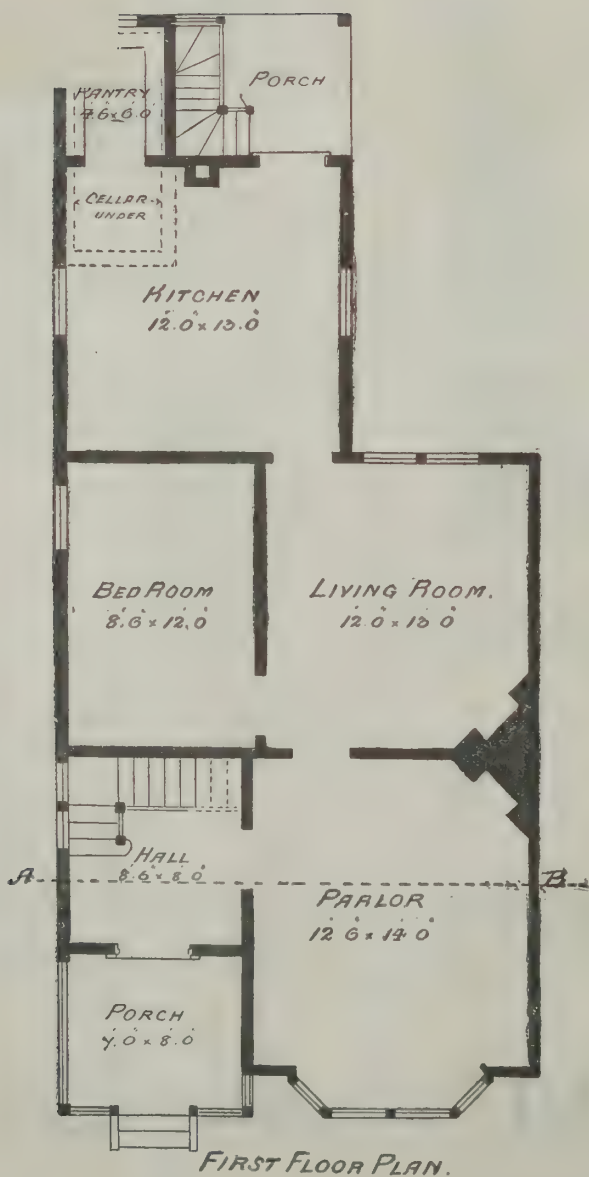




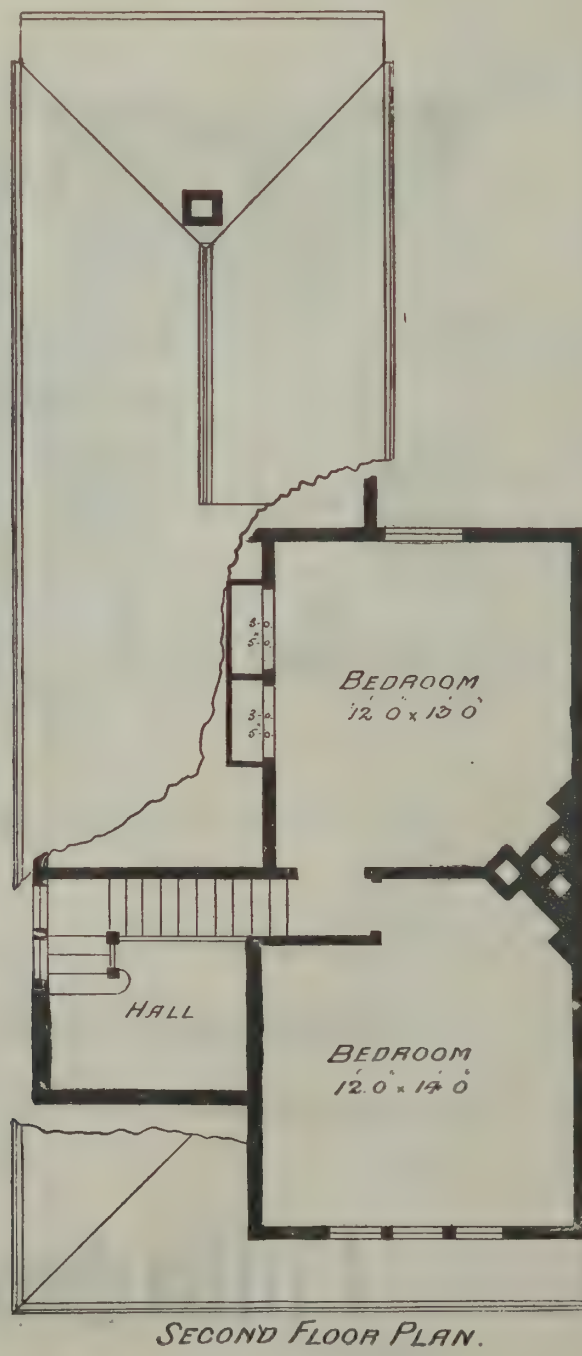
PLAN.

FLOOR PLAN OF SCHOOL HOUSE.

[For description see page 104. For perspective views see colored plates. For details see page 108.]



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

FLOOR PLANS—COTTAGES FOR \$1,500.

[For description see page 104. For perspective see colored plate. For details see page 109.]



## THE PRATT INSTITUTE.

One of the most interesting, and in some respects most remarkable, institutions of these later days is the grand establishment lately opened in Brooklyn, N. Y., known as the Pratt Institute. It consists of a vast establishment, fitted and furnished with great engines, furnaces, tools, and appliances for the benefit and teaching of some nine or ten thousand pupils, of both sexes, where they may enjoy, at a nominal cost, the latest and best instruction in the practical details of all the principal industrial arts and trades, including drawing, mechanical and free hand, painting, sculpture, architecture, carving, designing, decoration, type writing, stenography, book keeping, penmanship, type setting, building, carpentry, bricklaying, plumbing, tin working, brass founding, blacksmithing, machine work of all kinds, glass blowing, pottery, printing, weaving, industrial chemistry, steam engineering, electrical engineering, photography, domestic arts, and other branches too numerous to mention. Nearly all the various arts and trades are here taught, down even to cooking and dressmaking. The establishment is provided with a splendid reading room, library, art gallery, and museum. It is by far the most extensive institution of the kind in the world, and reflects immortal honor on its noble and generous founder, Charles Pratt, Esq., of Brooklyn—a distinguished merchant—by whom it has been erected at a personal cost of several millions of dollars.

Those who wish to avail themselves of the advantages of the Pratt Institute should address the secretary, Brooklyn, N. Y. We give a couple of exterior views of some of the buildings and one interior view. If we were to undertake to illustrate all the various rooms and departments of this great institution, it would occupy several numbers of our publication.

## The Drexel Building, Philadelphia.

This is one of the latest of Messrs. Wilson Bros. & Co.'s works. It is just finished, and as it is the largest and most important office building in Philadelphia, a notice of some of the special features of its construction will not be out of place. In size it is very nearly the same as the Equitable building in New York, covering rather less ground, but being three stories higher. The plan is like a huge letter H, and the dimensions—according to the *Public Ledger*, which is authority for many of the following points as well—one hundred and forty-two feet by two hundred and twenty, and the elevations show a cellar, a basement story, ten other stories, and an attic, bringing the roof to a height of one hundred and thirty-five feet above the pavement. On the west is Fifth Street, on the north Chestnut, and on the east and south Custom House Place and Library St. In the middle of the Chestnut Street front (the upper half of the "H") stands the Independence National Bank, occupying the only part of the block not owned by Mr. Drexel, who has torn down to make room for his new building the Law building, as well as the old Philadelphia library and the old post office, the quarters of the last two having been swept farther up town by the irresistible westward tide of business. The space below the cross of the "H" corresponding to that occupied by the Independence Bank is left as an open court. The effect of the Chestnut Street front is somewhat marred by the little bank tucked in between the two towering marble wings of the Drexel building, more especially as, owing to some disagreement about the terms on which light might be taken for the new building above the bank roof, there are no windows in the marble facing of the party wall. That so large a building should have been finished so quickly as this one is almost phenom-



PRATT INSTITUTE FOR INDUSTRIAL EDUCATION, BROOKLYN, N. Y.



THE PRATT INSTITUTE, BROOKLYN, N. Y.—VIEW FROM THE REAR PLAYGROUNDS.

as was the now universal covering in and heating of the building during the progress of the work, but a new method of construction—almost unknown before in this city—should have the largest share of the credit.

design a building that shall be really good if we are to keep getting the stone shell of it divided into smaller and smaller piers at the base, and the building itself towering higher than ever before. Perhaps it is not

too conservative a wish to hope that the same causes that have led the Pennsylvania Railroad management to discard iron bridges for stone in the future, to the immense relief of people who have the slightest regard for landscape beauty, will bring about the abandonment of the wholesale use of iron in our city buildings.—*Amer. Architect.*



THE PRATT INSTITUTE—THE FOUNDRY,

In order to get the greatest amount of light and room, the windows were made as large as possible, and the piers as small. Up the middle of each pier runs an iron column, and on these columns rest the floor girders, so that the masonry has nothing but its own weight to carry. The four largest marble quarries in the country were kept busy during the work, but even they could not supply material fast enough, so that the building would have been seriously delayed if it had not been possible to go on with the iron framework without waiting for its marble covering. At one time, in fact, the floor beams were in position four stories higher than the top of the walls. The southeast corner of Fifth and Chestnut Streets was, and still is, occupied by the banking house of Drexel & Co. It was desired to incorporate it in the new building, and this has been done with the utmost success, from an engineer's as well as from an architect's point of view. The ceiling of the banking room reaches the fifth floor of the new building, and the problem was to support the six upper floors and attic of the latter on top of it. Girders of sufficient strength would have been greatly in the way, and no columns could be set up in the banking room without being a serious disfigurement. The floors above are, therefore, held up by enormous trusses, running up through four stories, where they help to make partitions between the offices. The iron boxes on which the ends of these trusses rest are, to be sure, on the

inside of and anchored to the banking room wall, but as they were put up at night and after banking hours in the daytime, their erection in no way interfered

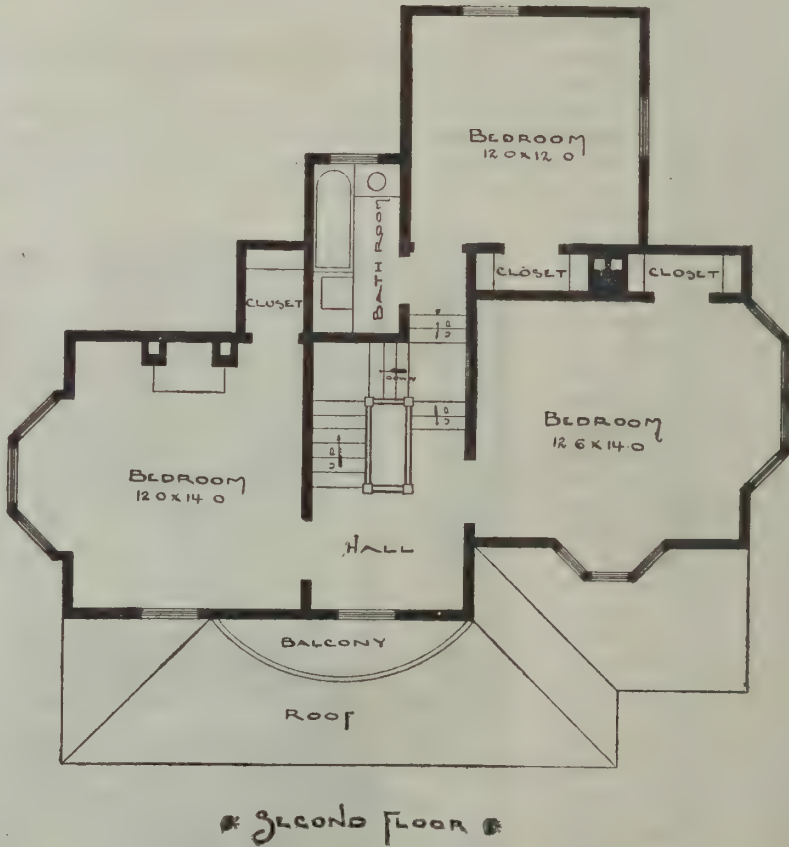
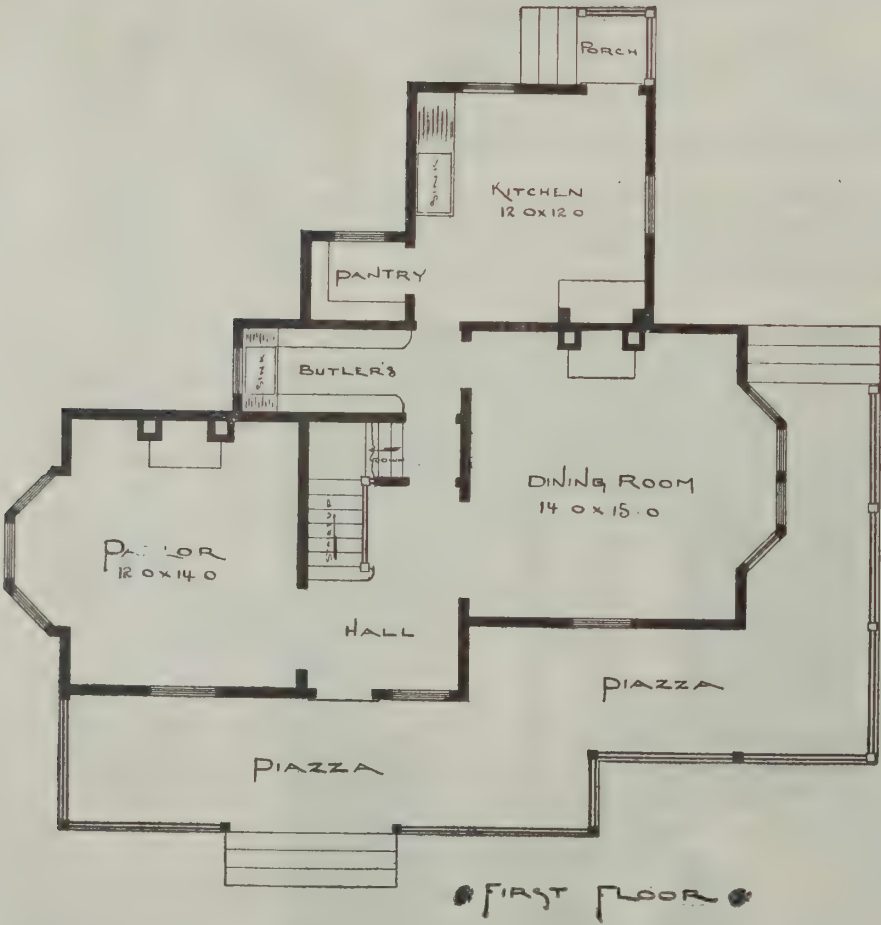
with business, and their covering of colored marble makes them rather an interesting feature than an eyesore. The rooms above the Board of Trade room (which is on the second floor of the eastern wing) are supported in the same manner. In the new building for the Provident Life and Trust Company, by the way, that is just begun a little farther down Chestnut Street, Mr. Furness has adopted a similar method of construction, where a higher truss even than this, the shape of the lower part of a letter "A," holds floor upon floor suspended from its upper angles.

In spite of the enormous advantages that the modern use of iron gives to the architects of to day in such cases as this, so that, as in the Drexel building, we may have, with a comparatively limited ground area, four hundred rooms all admirably lighted, and without an ounce of combustible material in their construction, it is to be doubted whether this increasing use of constructional ironwork is an unmixed blessing. As to its artistic effect, it will certainly be hard in the future, if experiment continues to open to us new capabilities in ironwork, to

FULL plans, specifications, and details ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.



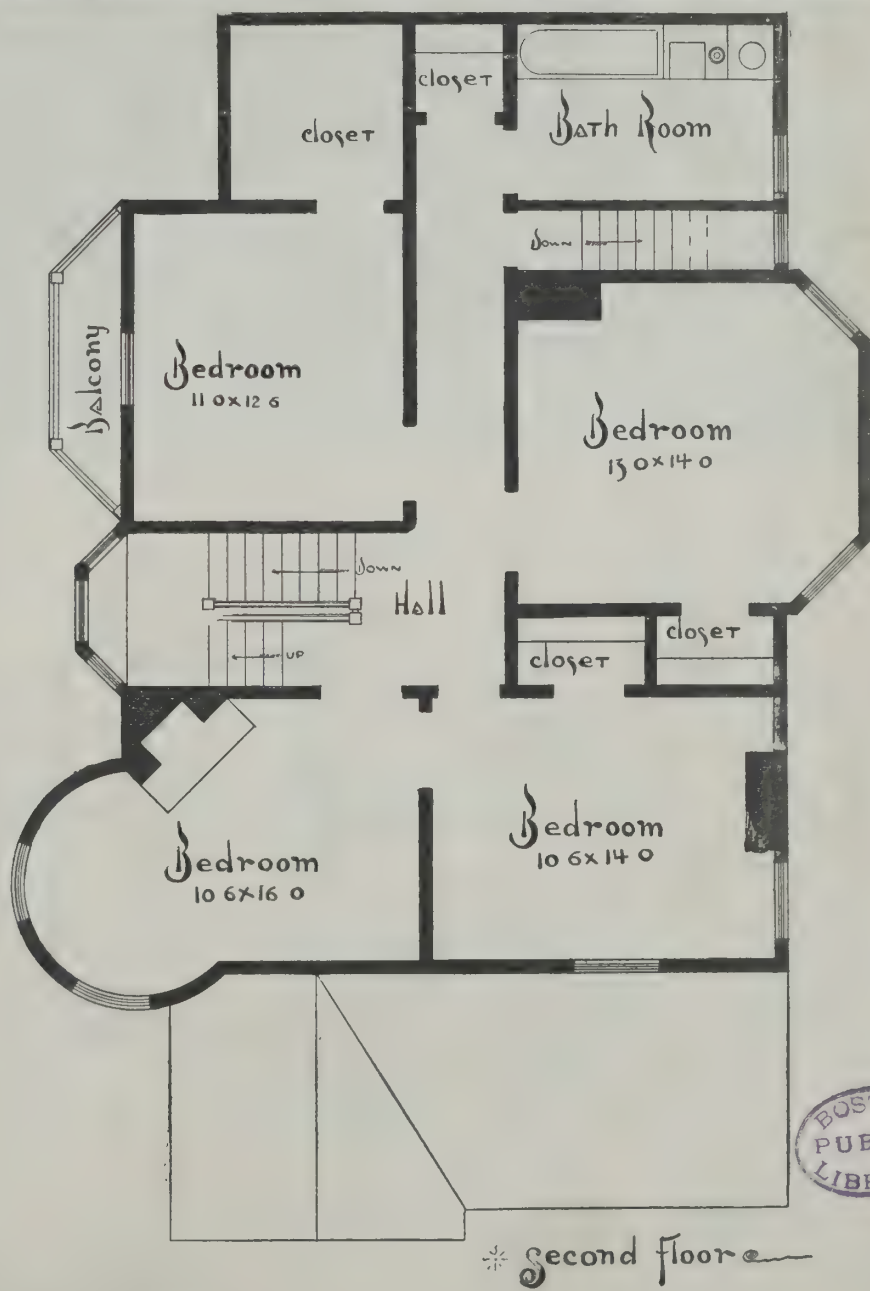
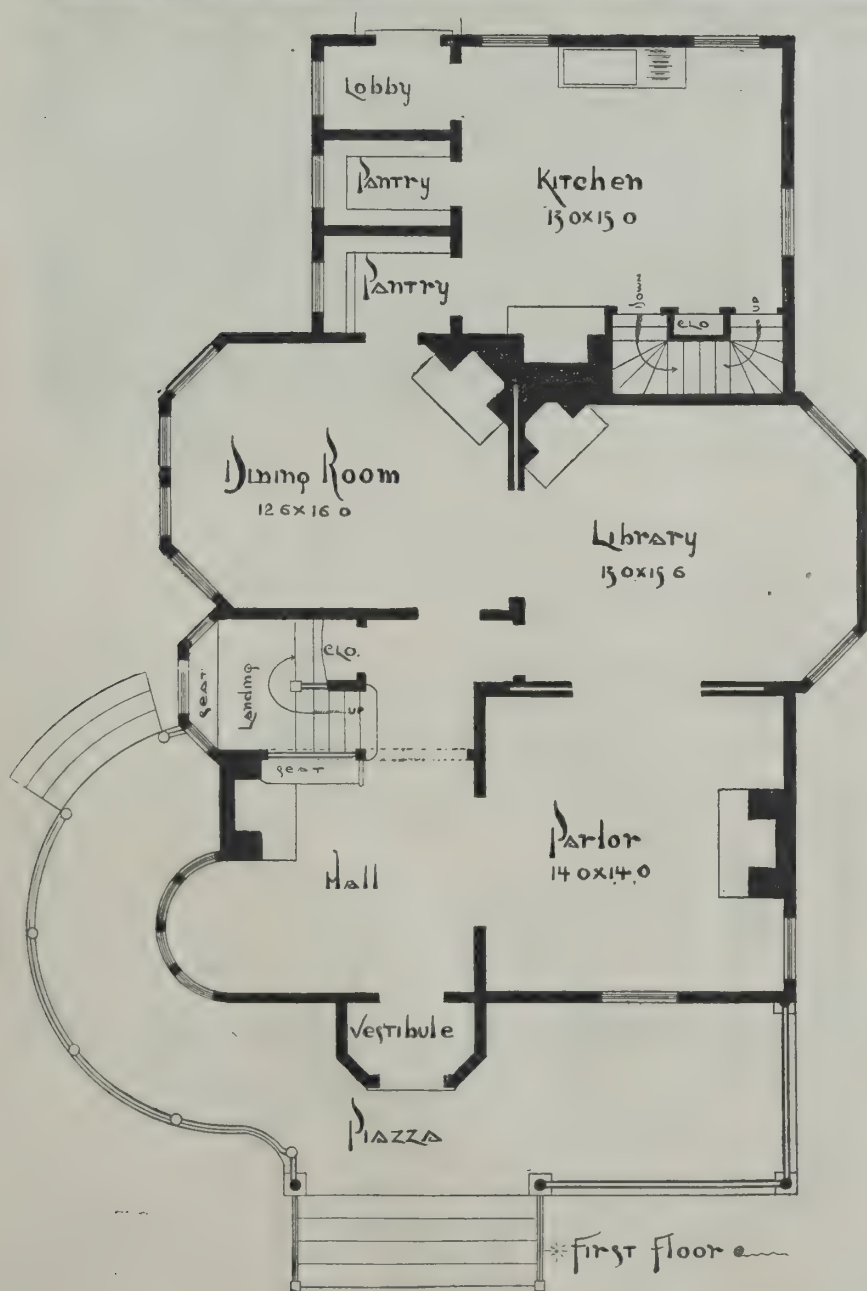


A COTTAGE FOR \$4,300.

[For description see page 121.]







A COTTAGE AT EAST ORANGE.

[For description see page 121.]



A SUBURBAN VILLA.

This villa has been built lately at Richmond Hill, Long Island.

It has a very attractive appearance, all the elevations are pleasing and the plans well arranged. The exterior has many pretty features, a fine piazza across the front, little balconies on side, all adding a pleasing effect. Fancy panels are introduced here and there.

The first story is clapboarded and painted a tile red, the second story covered with shingles and painted a canary yellow. The roof is shingled and is painted red.

The chimneys run high and are an architectural feature.

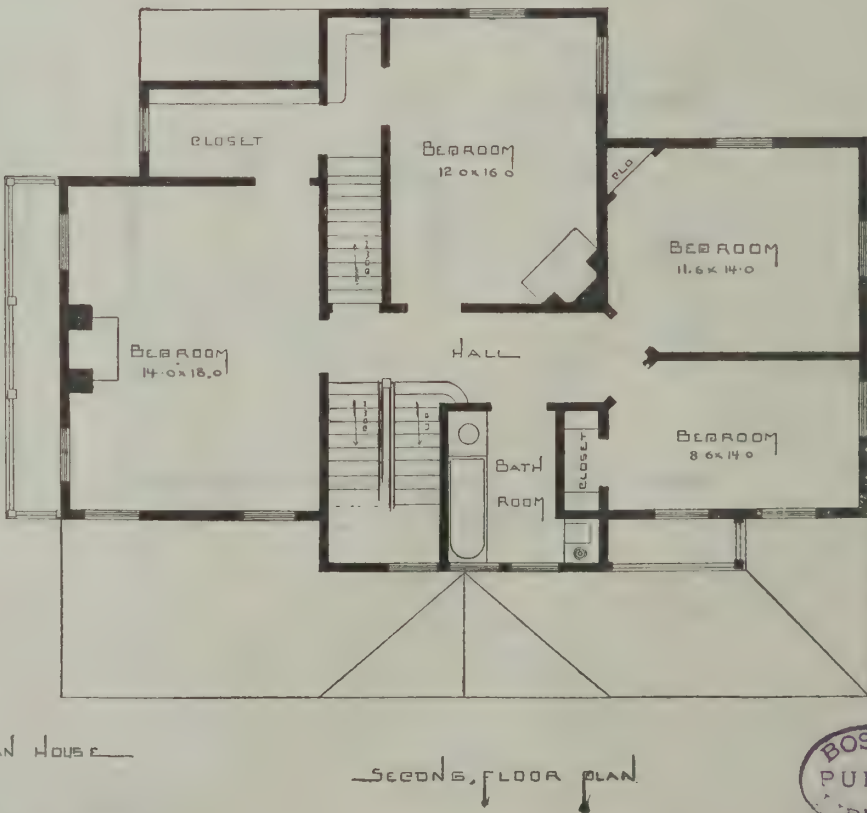
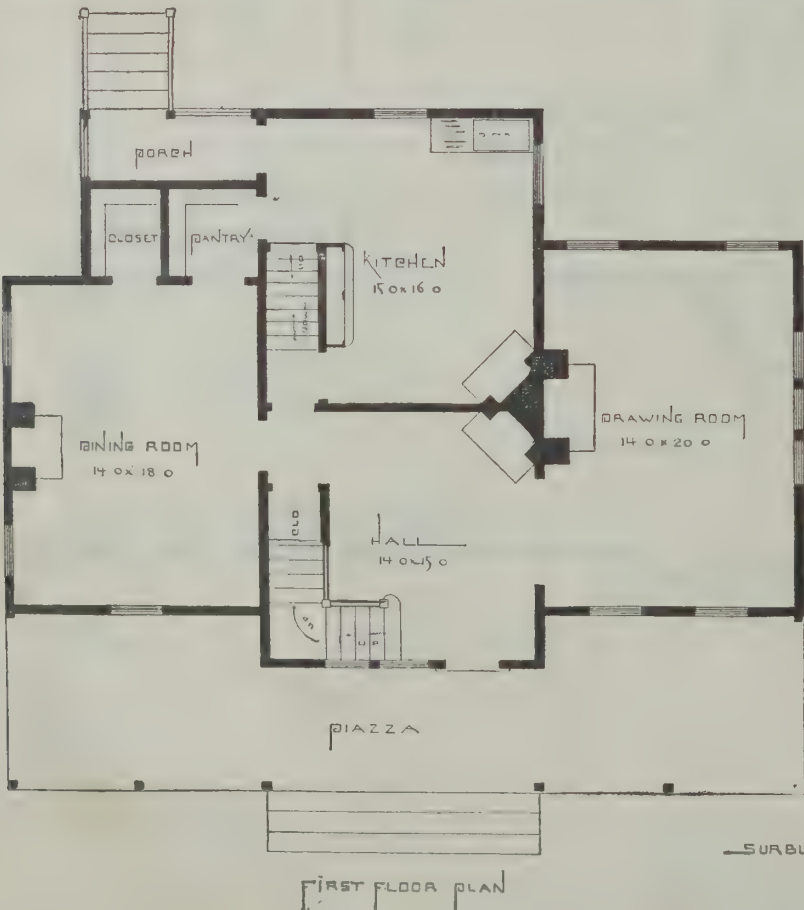
There is a cemented cellar under whole of this house, with furnace room; three large rooms and hall on first floor, four bed rooms and bath room on second floor, four rooms finished in attic.

The hall on first floor is large enough to be used as a sitting room, and contains a pretty staircase with neatly turned newels, posts, balusters, and rail; the principal rooms have open fireplaces, with neatly laid tiled hearths, and are provided with artistic mantels in cherry,

with plate glass mirrors. The drawing room, which is large, contains a piano window at side, with three small windows in a row. The dining room has a china closet, neatly fitted up with drawers and shelves, and a butler's pantry.

The kitchen is wainscoted with narrow beaded stuff. Stairs lead to cellar and second floor.

The bed rooms are well lighted, provided with neatly fitted up closets, etc., complete; the bath room is wainscoted and contains a bath tub, bowl, and water closet, all neatly fitted up and supplied with hot and cold



SUBURBAN HOUSE

SECOND FLOOR PLAN

A SUBURBAN VILLA.





water. The inside trim throughout is of cherry, and the door and window casings are all neatly beaded and band moulded.

The ceilings are neatly corniced, with center pieces. The house is piped for gas.

This house cost \$7,000 to build, but might be constructed at a less cost in some localities.

A RESIDENCE AT EAST ORANGE, N. J.

We herewith give an engraving of a country residence at East Orange, N. J., for Mr. Morrill.

The excellence of the design has attracted attention, the elevations are pleasing, also the plans of the interior.

The front arch, which is of brownstone, is a pretty feature. The circular corner runs up two stories and rises into a tower covered with copper and spotted with balls. The octagonal projection runs up two stories

also, and rises into a tower, all of which form architectural features.

The first story is covered with beveled white pine clapboarding, while the second story is covered with shingles, laid in a fancy manner. The roof is shingled.

There is a cemented cellar under whole of house, with furnace and laundry rooms. The latter is furnished with wash trays supplied with hot and cold water.

The entrance vestibule has a floor laid in tiles, and a pleasant nook at the left of same, with fireplace, hearth, and mantel built up of brick, with windows on either side, glazed with stained glass.

The hall is large, and separated from the principal rooms on this floor by sliding doors. It has a floor laid in oak, and contains a grand staircase with carved newels and posts, balusters, and rail neatly turned.

The drawing room is finished in white and gold, with

carved casings. The nook has a window seat and open fireplace with tile hearth, and mantel.

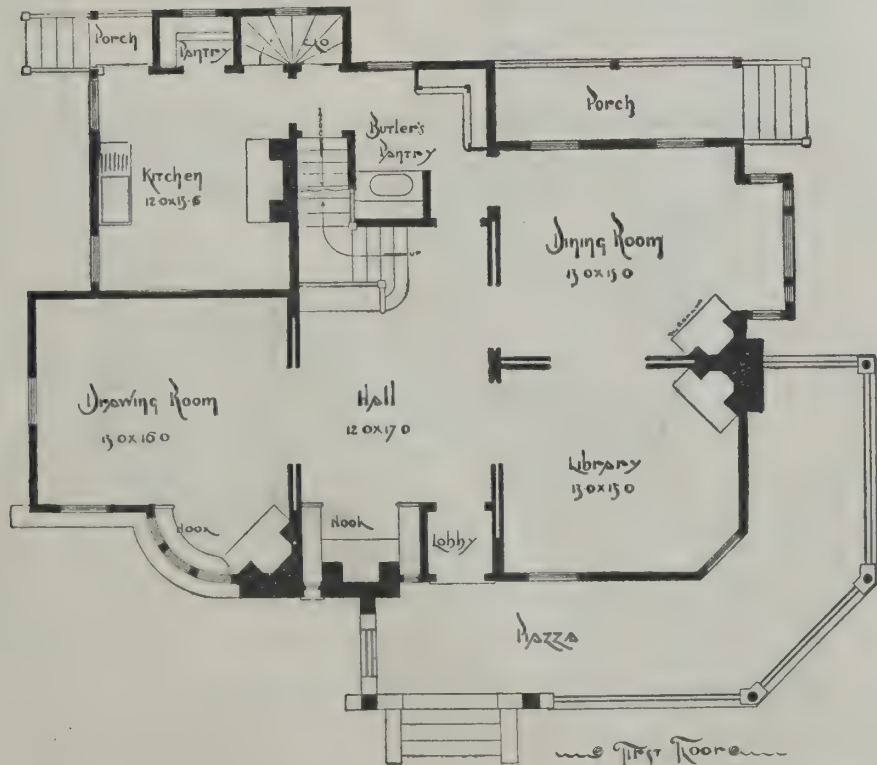
The library is finished in cherry, and provided with mantel, with open fireplace. The ceiling has floor beams that drop down six inches below ceiling, and are heavily moulded.

The dining room is finished in oak, has a bay window at side, also a corner fireplace finished with tiled hearth and mantel of oak. The butler's pantry is large and well lighted. Kitchen is neatly wainscoted, and finished with a neat moulded cap.

There are four good sized bed rooms on second floor, well lighted and ventilated, amply provided with closet room. These rooms are finished in white pine. Fireplaces, tiled hearths, and mantels.

The bath room is wainscoted, and provided with all the modern improvements.

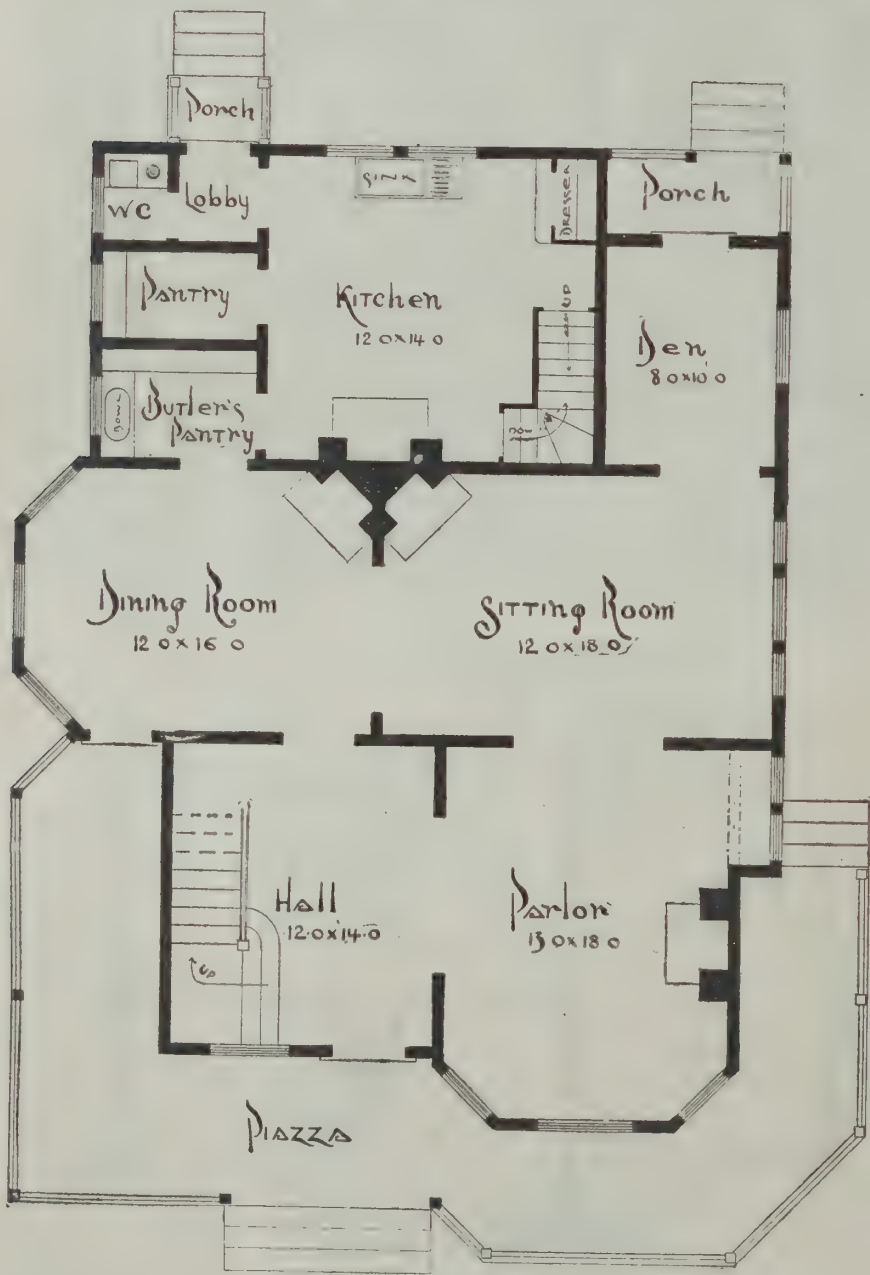
Attic has two bed rooms and billiard room.



A RESIDENCE AT EAST ORANGE, N. J.







first floor

House at Orange

second floor

A RESIDENCE AT ORANGE, N. J.

[For description see page 121.]

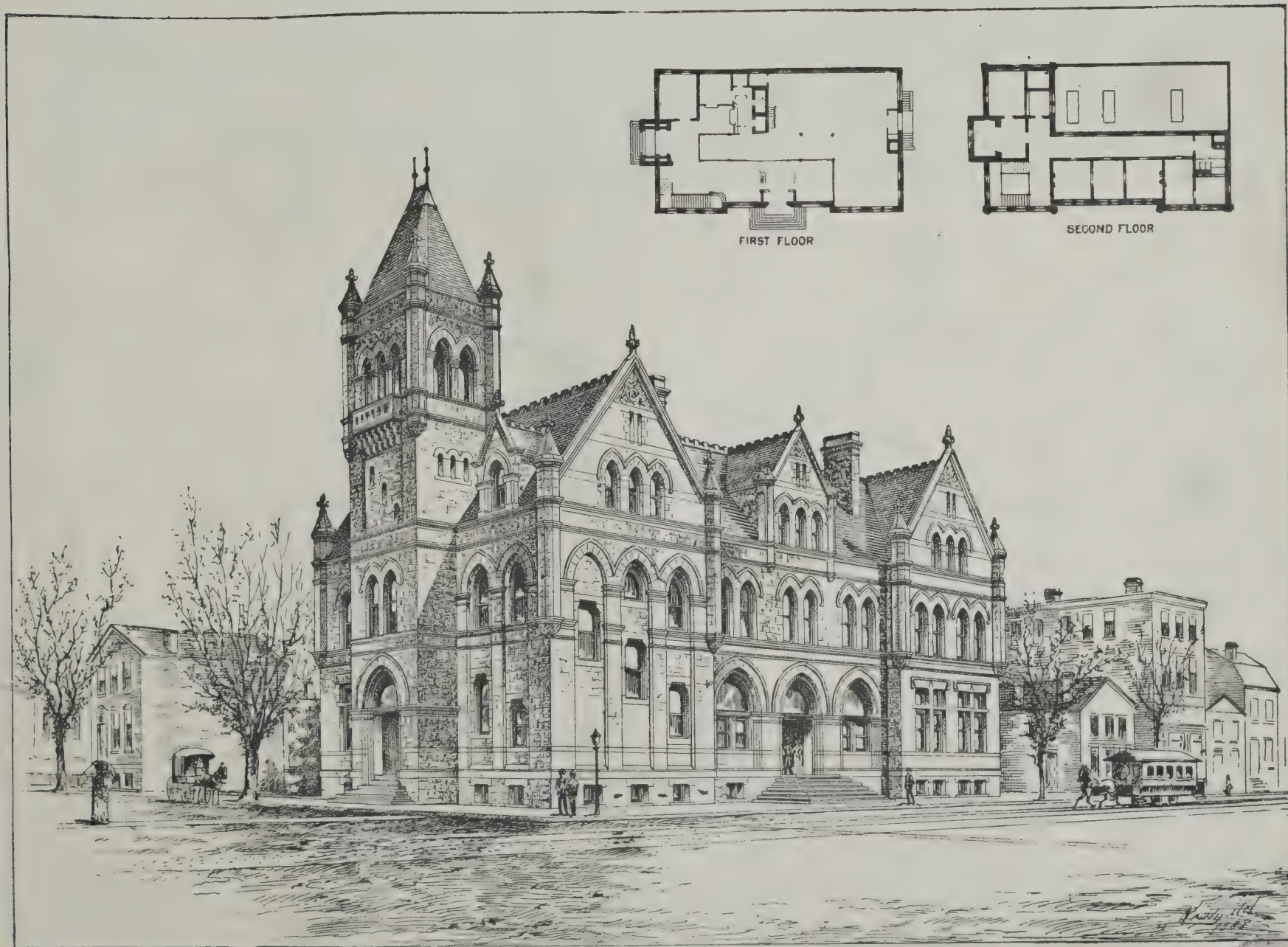






NEW COURT HOUSE AND POST OFFICE, ABINGDON, VA.

[For description see page 121.]

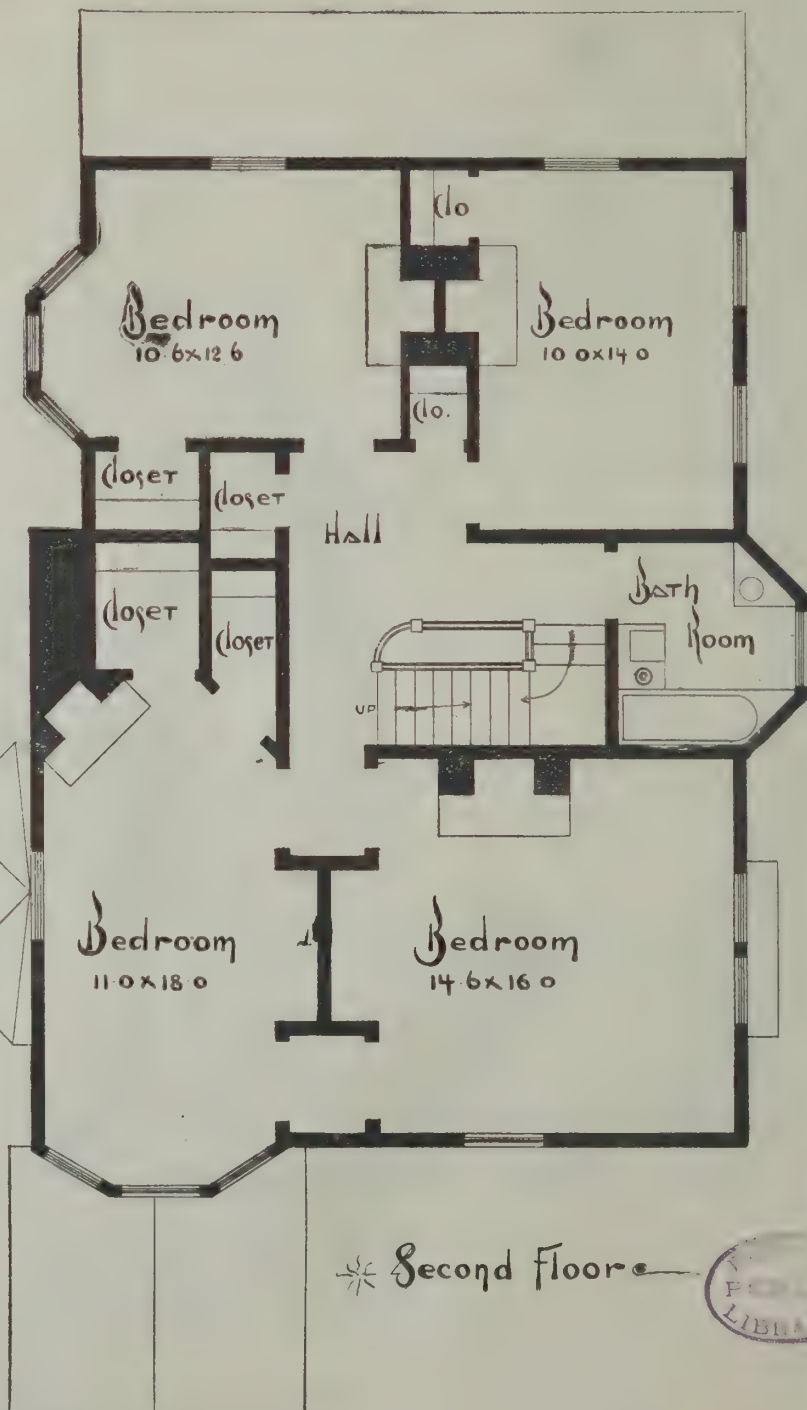
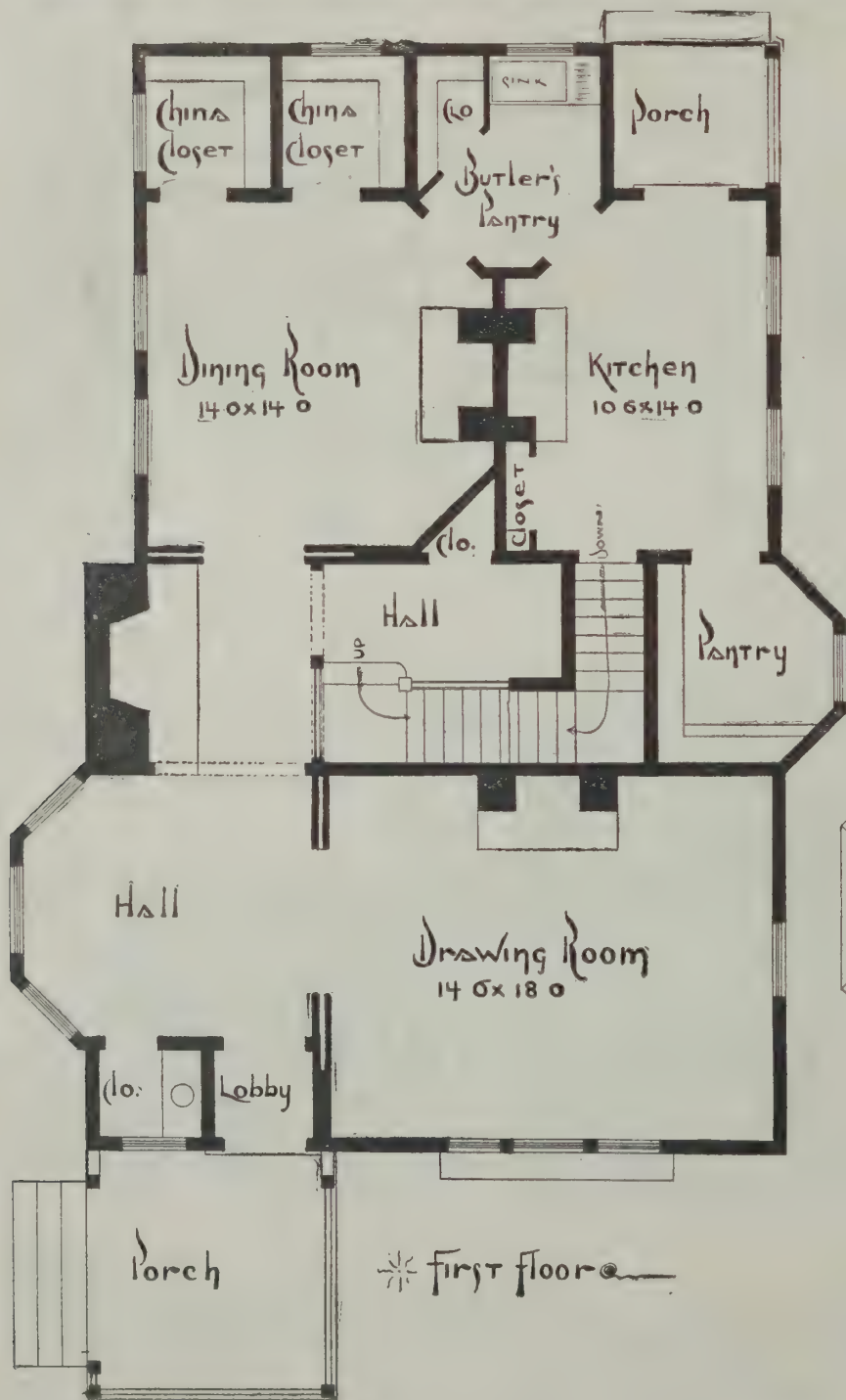


THE NEW GOVERNMENT BUILDING AT DAYTON, OHIO.

[For description see page 121.]

PAUL  
PUBL  
LIBR





A SUBURBAN RESIDENCE.



A SUBURBAN RESIDENCE.

An admirable design for a suburban house is the one of which we give herewith an engraving, with floor plans. The perspective is from a photograph, taken especially for the SCIENTIFIC AMERICAN.

It is one of the prettiest cottages in East Orange, of the Queen Anne type. The elevations are all pleasing, and the floor plans equally so.

The house is constructed in the usual way, and the

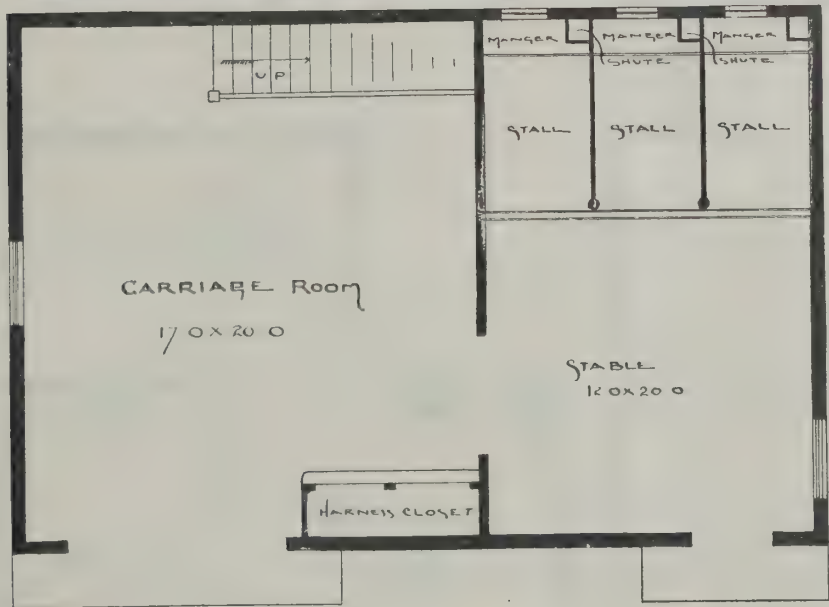
The door and window casings are neatly beaded and corner blocks are provided. The trim throughout is of whitewood stained cherry. Part finished in the natural. The floors laid in narrow widths in ash. The parlor is large, also the dining room, both of which are separated from the hall by sliding doors, and are provided with open fireplaces, tiled hearth, and handsome wood mantels. The china closets in dining room are well fitted up. The kitchen is wainscoted with

A BARN AND CARRIAGE HOUSE.

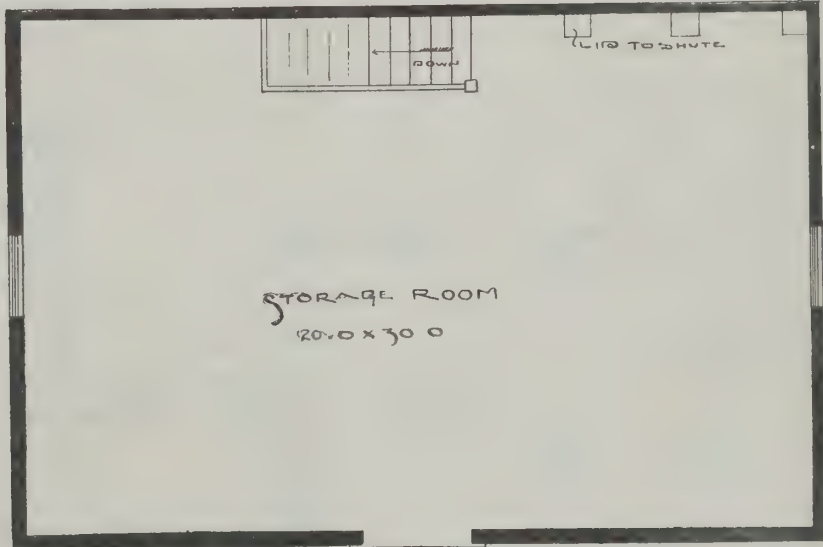
We give a perspective, from a photograph, and plans of a neat little barn built at Richmond Hill, Long Island, for G. F. Fowler, Esq.

It has a brick underpinning. The exterior is covered with matched sheathing before the clapboards and shingles are laid.

The roof has a little gable and dormer windows, all shingled.



FIRST FLOOR



SECOND FLOOR

A BARN AND CARRIAGE HOUSE.

materials are of the best quality of their respective kinds, all finished in a thorough, workmanlike manner.

The underpinning is of brownstone, laid in red mortar, part of this underpinning running up high for chimney, that rises high above the roof and forms an architectural feature in itself. The roof is slated.

There is a cemented cellar under whole of house; contains furnace room, also laundry neatly fitted up, wash-trays, supplied with hot and cold water.

The first floor contains an ample hall, with a pleasant bay, and fireplace with hearth neatly laid in tiles, and mantel of hardwood. The staircase has newels, posts, balusters, and rail, all neatly turned.

narrow beaded stuff, and is finished with a neat moulded cap. Stairs lead to cellar. The pantry is neatly fitted up. There are four good sized bedrooms on second floor, provided with neatly fitted up closets and pleasant open fireplaces, tile hearths, and wood mantels. The bath room is neatly wainscoted similar to kitchen, and is furnished with bath tub, wash bowl, and water closet, supplied in the usual way. There are two rooms neatly finished off in attic, besides ample storage room. The ceilings are neatly corniced, and centers are placed in position. The house is piped for gas. The cost of the house was \$9,000, complete. Lately erected at East Orange, N. J.

The barn is painted, first story in dark, while the trimmings are of dark olive green and the second story light yellow. Roof dark red.

The interior partitions are neatly ceiled up with white pine, narrow, and beaded.

There is a carriage room, 17x20, with harness closet and stable, 12x20, with stalls provided with mangers and feed chutes, complete.

Second floor contains a hay room and feed bins. A servant's room in attic could be easily fitted up.

This stable cost the sum of \$800, complete, to build in Richmond Hill, but it could be built for considerably less in some other localities.



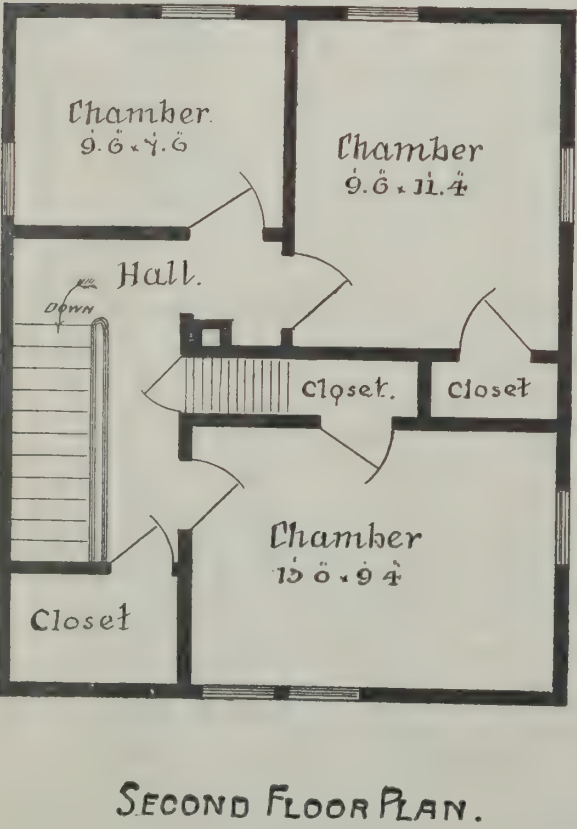
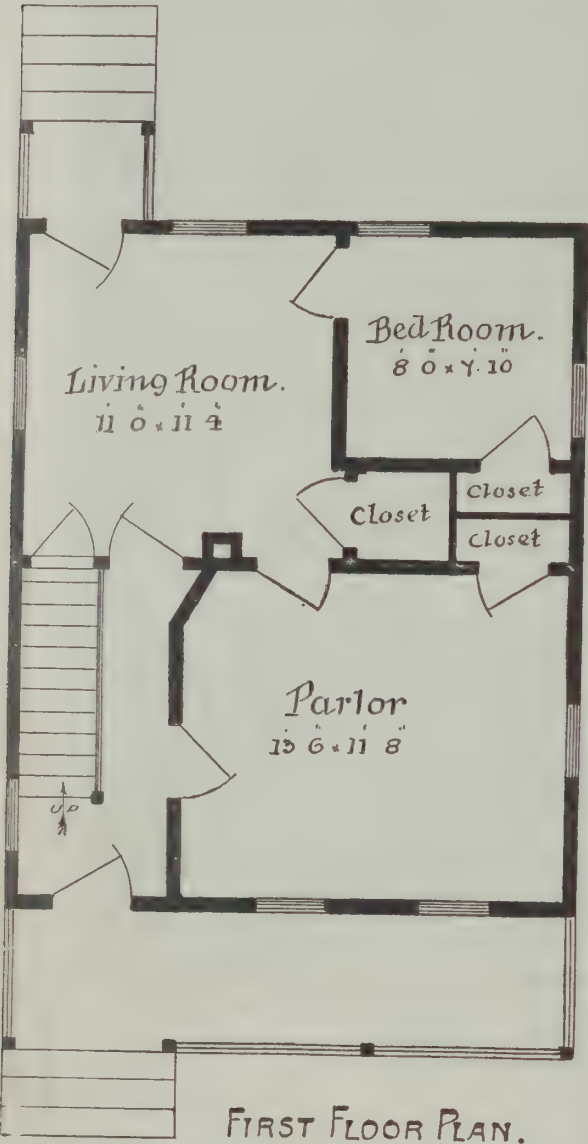
Ancient Sanitation.

Towns must have fearfully suffered before the inhabitants learned that the houses must be so far separate as to allow air to blow between them. The Greeks must certainly have made their cities and many of their streets exceedingly handsome, but their earlier towns, and even Athens, were too much crowded; and so much did they fear jobbery among the sharp-eyed business-men of the city, that they dared not trust any one with money to rebuild the place. In Constantinople, Zeno ordered all houses to be twelve feet apart all the way up, and the projections which caused the houses nearly to meet above were disallowed. This was an effort after a long interval of neglect. He attempted also to go farther, and ordered that no one should stop the view of the sea from his neighbor. This would be well in our sea-bathing towns, where houses are built before others without pity, and not only is the view destroyed, but the whole living of the families who possess it, and to whom the view paid the rent. But the laws are of no value unless a strong and vigilant executive attends to them. Constantinople became so bad that its destruction by fire was scarcely deemed a misfortune. How infected by their own crowding the Romans must have been when the

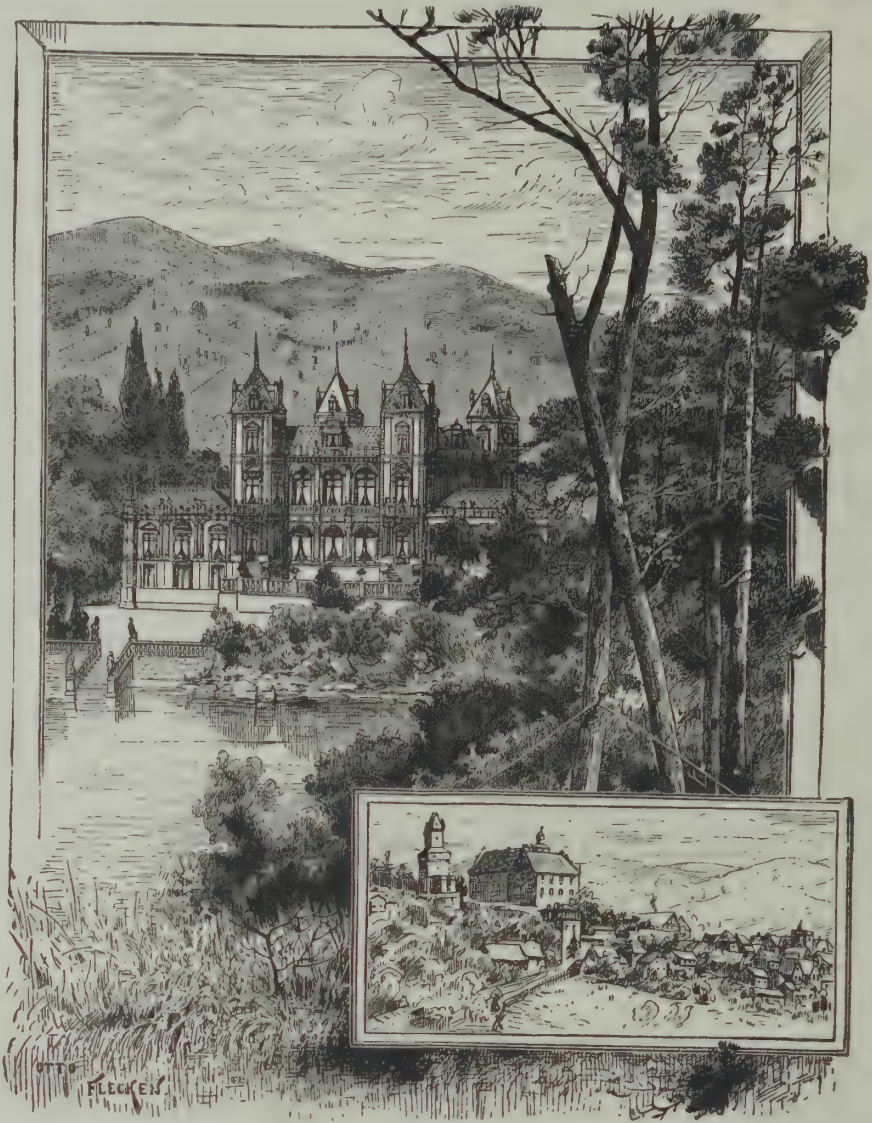
houses were ordered to be at least five feet apart and not more than nine stories high. Augustus said they should not exceed seventy feet in height, and Trajan made the limit sixty. The laborious proofs that sewer air is unwholesome have taken commissions and boards of health many years of hard labor in our time, but

NEW RESIDENCE OF THE EMPRESS OF GERMANY.

The Villa Reiss, a handsome villa, has been bought by the Empress Frederick of Germany as a summer residence. It is most picturesquely situated near Cronberg, among the Taunus Mountains, about five and a half miles from Frankfurt, and has fine grounds of



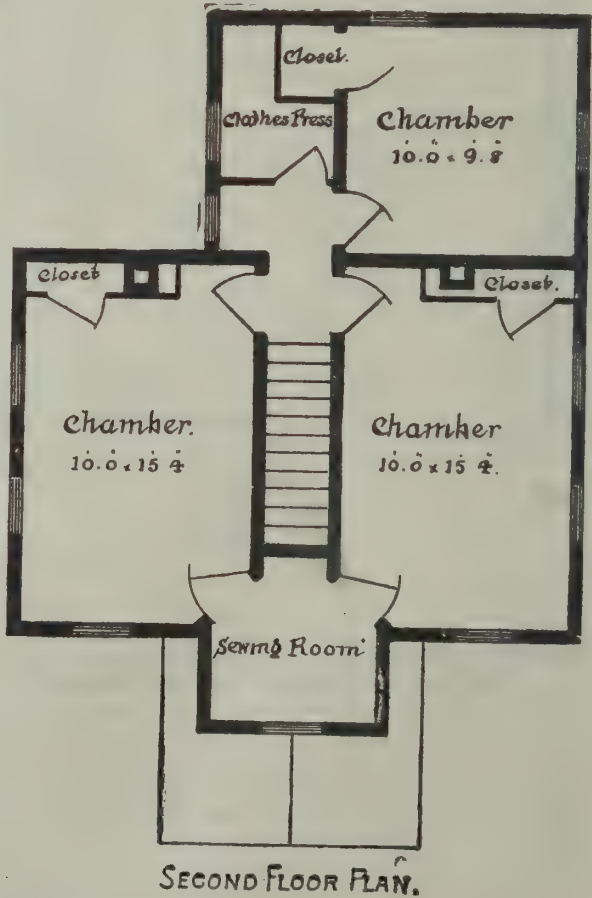
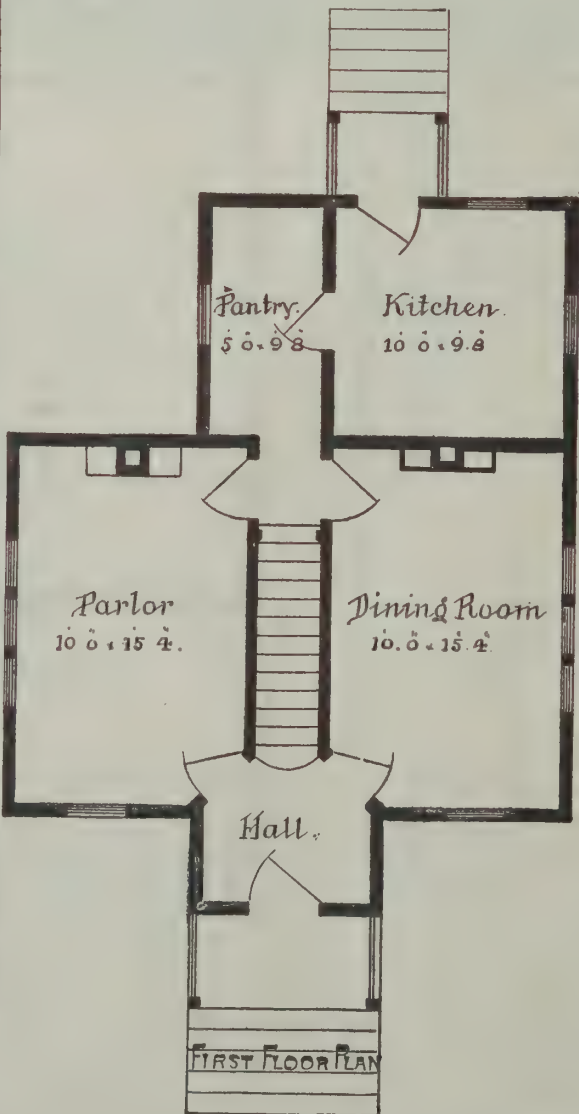
FLOOR PLANS FOR COTTAGES OF MODERATE COST GIVEN IN NOVEMBER NUMBER.—[See page 104.]



THE VILLA REISS, NEAR CRONBERG, TAUNUS MOUNTAINS, GERMANY.

the whole is so clearly recognized in Justinian's Digest, in quotations from Ulpian, that it is evident that the question was then past all dispute. The world is obliged occasionally to revive its principles. However true may be the opinion that man is always in progress, we cannot deny that he often makes, in certain places, wonderfully long steps backward.—G. Wilson.

more than one hundred acres. It is now being enlarged and altered, and will afford very pleasant summer quarters for the Empress and her family. Cronberg itself, which contains 3,000 inhabitants, is very prettily situated on a hill, and is surrounded with fruit orchards and chestnut woods. It is commanded by a fine old castle, the Schloss Cronberg. The Empress is stated to have paid \$100,000 for the Villa Reiss.—The Graphic.















❖ A VILLAGE SCHOOL-HOUSE ❖

BOSTON  
PUBLIC  
LIBRARY







**A COTTAGE AT NEW ROCHELLE.**

On Sound View Hill, New Rochelle, New York, this attractive little cottage has been erected lately, at a cost of \$4,000 complete.

Our engraving was prepared direct from a photograph of the building, taken specially for the *SCIENTIFIC AMERICAN*.

The frame is inclosed with matched sheathing, then covered with felt paper, the clapboards and shingles are then laid.

A cemented cellar under whole of house is provided with coal and wood bins neatly fitted up, also furnace and laundry rooms, the latter being provided with neatly fitted wash trays supplied with hot and cold water.

Foundation of stone, with underpinning of brick laid in white mortar.

There is a pleasant piazza across the front, with octagonal projection at side. The exterior of house is covered with beveled white pine clapboarding, with shingles.

There is a spacious hall, parlor, dining room, kitchen, and butler's pantry, on first floor. Three good sized bed rooms and bath room on second floor. Two rooms finished off in attic, besides ample room for storage; all the bed rooms are provided with closets, shelves, etc. The bath room is furnished with bath tub, wash bowl, and water closet, all supplied with hot and cold water.

The principal rooms have pleasant open fireplaces, with neatly laid tiled hearths and handsome hardwood mantels. The hall has a staircase, with newels, posts, balusters, and rail, all neatly turned. The door and window casings are neatly beaded and turned sunk angle blocks are at corners. Trim throughout of whitewood, finished in the natural.

The kitchen, butler's pantry, and bath room are wainscoted with narrow beaded stuff, finished with a neat moulded cap.

The exterior is painted a dark lead color, relieved with dark red trimmings.

**A COTTAGE FOR \$4,300.**

Our illustrations show a pleasing cottage at Rochelle Park, N. Y., lately built for Mr. Waldorf, at a cost of \$4,300.

It has a cemented cellar, with coal and wood bins, furnace room and laundry.

The foundation is of stone, with underpinning of brick.

The exterior of first story is covered with clapboarding, the second with shingles.

The first floor, exterior, contains a piazza which runs across front and returns on the side. On the interior there is a parlor, dining room, large hall, kitchen, pantry, and butler's pantry. The three latter are wainscoted with narrow beaded North Carolina pine.

The trim on this floor is of solid cherry, with casings beaded and band moulded and highly polished, except kitchen.

A cherry staircase, with turned newels, balusters, and rail, leads to three good sized bed rooms and bath room on second floor.

Bath room is fitted up with tub, wash bowl, and water closet, supplied with hot and cold water.

The bed rooms are neatly fitted up with closets, etc.

There are three finished rooms in attic, besides storage room.

The trim of second floor is of white pine, with casings beaded and turned sunk angle blocks. The first floor is laid in hardwood in narrow widths.

The parlor and dining room have open fireplaces, with tile hearth and artistic cherry mantels, plate glass mirrors, etc.

The bed room over parlor has an open fireplace, with tile hearth and neat wood mantel.

The ceilings are neatly corniced and flower pieces are provided for centers.

The house is piped for gas and is heated by a furnace.

Our perspective was prepared direct from a photograph of the building, specially taken for the *SCIENTIFIC AMERICAN*.

**A COTTAGE AT EAST ORANGE.**

We herewith give an engraving of a very attractive cottage built recently at East Orange, New Jersey.

The first story is covered with beveled white pine clapboarding, and the second story with shingles laid as shown in the engraving, which was prepared direct from a photograph of the building, made specially for the *SCIENTIFIC AMERICAN*. The roof, which is covered with octagonal cut slates, shows pretty gables and dormer windows. The piazza extends across the front. A pretty balcony at level of second floor at side.

There is a cemented cellar under whole of this house, with furnace room and laundry. The latter furnished with neatly fitted up wash trays, supplied with hot and cold water, etc.

The first floor contains a large hall, with lobby and a pretty nook, with a window seat. A unique staircase, with newels, posts, balusters, and rail, all neatly turned out of whitewood. The parlor and dining room are large and contain neatly fitted open fireplaces, with

tile hearths and artistic wood mantels, parlor having two small windows at either side of fireplace, with stained glass. The dining room has a square bay window at side. At the rear is a butler's pantry neatly fitted up. The kitchen is large, neatly wainscoted with narrow beaded stuff, and is finished with moulded cap.

The inside trim of this house is of whitewood, finished in the natural; with door and window casings all neatly beaded, with turned and sunk corner blocks at angles.

On second floor there are four good sized bedrooms, with ample closets. All the rooms are well lighted. The front bedroom has a pretty fireplace, with tile hearth and mantel. A door opens out upon the balcony. The bath room is neatly wainscoted same as kitchen, and is furnished with bath tub, bowl, and water closet, all neatly fitted up and supplied with hot and cold water.

There are three neatly finished off rooms in the attic.

The house is provided with Venetian blinds on the inside, the ceilings are neatly corniced, and center pieces are provided. Gas is furnished, and everything complete.

This house is extra well built, and cost \$6,000, but in some localities it could be built for considerably less.

**A RESIDENCE AT ORANGE, NEW JERSEY.**

This compact, convenient, and attractive house was lately built on Renolds Terrace, in Orange, New Jersey, at a cost of \$8,000.

Our perspective was prepared direct from a photograph of the building taken especially for the *SCIENTIFIC AMERICAN*.

The exterior is covered with clapboarding, painted a light brown, with trimmings of a darker shade, shingles stained cherry color, the roof slated.

One of the pleasing features is the piazza that runs across the front and two sides. Other features are the balcony and the octagonal projection at side that runs up two stories and forms a look-out at attic. The house is situated on a terrace, and a beautiful view of the Orange Mountains is obtained.

There is a cemented cellar under whole of house that contains a laundry nearly fitted up with wash trays, and supplied with hot and cold water; coal and wood bins fitted up in the usual way; furnace room, a large furnace; the ceiling to the cellar is lathed and plastered.

An ample hall communicates with the dining room and parlor by sliding doors. The parlor and sitting room are similarly connected. The chimneys are so distributed that several open fireplaces are obtained. All have neatly laid tiled hearths and handsome mantels of hardwood.

The door and window casings are all neatly beaded, and corner blocks are provided. The inside trim to hall is of old oak. There is a very pretty staircase, with massive newel, and posts, rail, and balusters, neatly turned. On this staircase and in hall there are windows with stained glass. The parlor is finished in mahogany, and Venetian blinds are provided in bay. The sitting room is in cherry, and the dining room in oak. The rest of the woodwork is of whitewood.

The kitchen and its apartments throughout are all wainscoted with narrow beaded stuff, and finished with a neat moulded cap. There is a butler's pantry, neatly fitted up and supplied with hot and cold water, dresser complete. The kitchen is well fitted up, and supplied with all the best conveniences.

There are four bed rooms on second floor, besides studio and bath room. All the bedrooms are provided with ample closet room, all neatly fitted up with drawers and shelves. Some of the closet doors have artistic spindle arches over. The bath room is neatly wainscoted and contains a bath tub, wash bowl, and water closet. Studio has a glass door that opens out upon balcony. Stairs lead to attic, where are four large rooms. The ceilings are neatly corniced, and centers are provided.

**NEW COURT HOUSE AND POST OFFICE, ABINGDON, VA.**

The new United States court house and post office building for Abingdon, Va., is in process of construction, and will probably be completed, ready for occupancy, the early part of 1890. It is situated in a desirable location on the main street, and, as shown in illustration, is three stories in height, with basement and attic.

To the height of first story will be of stone, above that face brick, with stone trimmings. Frieze of terra cotta, the floors and roof being of wood. Interior finish of pine throughout. To be heated with hot water. There being no sewer system, the entire sanitary arrangements are outside of the building. A feature of the arrangement is that a separate entrance is had to the upper stories, containing court offices, etc.

In the basement are located heating apparatus, and coal space, storage, etc. First story, post office, working room; postmaster's office, and money order department, with large corridor space, for public. Large stair hall leading to upper stories.

The entire space on second floor is devoted to court

room, 33'x41', together with offices for clerks and judge.

Third story, offices signal service; attic, storage, files, etc.

On the roof will be accommodations for observation and display of signals, in connection with signal service.

Appropriation, \$87,000. Cost of site about \$15,500. William A. Freret, supervising architect.

**THE NEW GOVERNMENT BUILDING AT DAYTON, OHIO.**

The new building for the United States post office, etc., at Dayton, Ohio, will soon be under process of construction. Situated as it is at the corner of Main and Fifth Streets, it will be convenient of access to the business portion of the city, and will furnish ample accommodations for the present as well as the future. The building is about 115'x163', two stories, attic, and basement. A portion of the rear is carried up but one story, thereby enabling the post office working room to be lighted by skylights, as well as large window space.

The style of the building externally is Gothic in treatment, although without any elaborate ornamentation, the material being rock-faced limestone.

The space in the building will be conveniently arranged to accommodate the following offices:

First floor, 18' high, will be devoted entirely to the requirements of the post office, ample working and office room, money order and register divisions being given, as well as large corridors for the public. This first floor is fire proof, those above, as well as the roof, being of wooden construction.

On the second floor are located the offices for internal revenue and pensions. The attic will be used as storage and files rooms. The basement will contain the steam heating apparatus, coal and other storage accommodations. William A. Freret, supervising architect.

A prominent feature of the building will be the tower, on the Main Street front, which will be about 100 feet high.

The entire building will be finished in pine, painted, the corridors being marble tiled.

Ample and convenient sanitary arrangements, as well as fireproof vault spaces, have received prominent attention.

The total appropriation was \$150,000, from which about \$40,000 was used to purchase the site, leaving the balance for the heating and construction of the building, as well as the approaches to same.

**The Effect of Adding Sugar to Cement.**

Experiments upon the effect of the addition of sugar to cement mortar have been recently conducted by Captain A. Von Grunzweig, of Vienna, the results of which have just been published. Mixtures were prepared of 1 cement to 3 sand, with 10 per cent. of water, and also of pure cement with as much water as was required to give the mass the necessary plasticity. From 1 to 5 per cent. of dry powdered sugar was well mixed with the dry cement before gauging. The cement used was of inferior quality, and only common, not selected, or "normal" sand was employed. The briquettes were otherwise prepared in accordance with the rules for testing Portland cement laid down by the Austrian Society of Engineers and Architects, but were laid aside to harden in a dry place, and not under water. For these reasons the strength procured was far below that prescribed and generally obtained. All the samples were prepared by the same person, under the same conditions, and with the same care. For every series of samples of mortar to which sugar was added, a comparative series without sugar was made. The tensile strength of the briquettes was ascertained by Kraft's cement-testing machine. It should be mentioned that the samples containing sugar (especially those without sand) showed a strong tendency to adhere to the surface of the smooth china plate on which they were placed, and also to swell. The experimenter gives full particulars of the tests, which are summarized in the *Builder*. As a general result, it is stated that with mixtures of cement and sand, hardened in a dry place, the binding effect may be increased by the addition of sugar, the addition reaching its maximum with from 3 to 4 per cent. of added sugar. With pure cement the addition of sugar had no additional binding effect.

The jury appointed to examine the second series of designs submitted in the competition for the facade of Milan Cathedral have awarded the first prize of \$8,000 to M. Brentano, of Milan, who is to be entrusted with the execution of the works. Prizes of \$1,000 each are obtained by Messrs. Deperthes, of Paris; Beltrami, of Milan; and Nordio, of Trieste. The winners of \$600 are Messrs. Dick, of Vienna; Weber, of Vienna; Moratti, of Milan; and Locati, of Milan. The prizes of \$400 are given to Messrs. David Brade, of Kendal; Becker, of Mayence; Hartel et Neckelmann, of Leipzig; Cesa Bianchi, of Milan; Azzolini, of Bologna; and Ferrario, of Milan.



## THE NEW YORK SAFETY DUMB WAITER.

The accompanying illustration represents a safety dumb waiter, made by the Edward Storm Spring Co., Limited, Poughkeepsie, New York.

Although these fixtures have been on the market but little over a year, we are informed that three thousand of them are now in use, in all sections of the country. This company are also manufacturers of an elevator fixture, called the Humphrey Pony Hand Elevator, capacity five hundred pounds, a cut of which can be seen on page vii of last issue.

The fixtures are sold alone for either of these machines, and can be put up by any carpenter or builder, or the makers will furnish the woodwork also, including cars, guide runs, etc., complete. All who are interested should send to the manufacturers for a copy of their descriptive and illustrated catalogue, which will be furnished free on application.

Full sized working models of these machines can be seen at the store of

Messrs. John H. Graham & Co., 113 Chambers Street, New York, or at the American Institute Fair.

## THE AUTOMATIC REGULATION OF THE TEMPERATURE IN HOUSES.

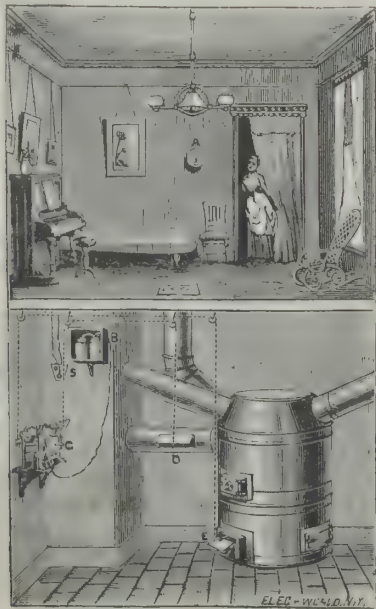
Among the early appliances in the form of an electrical regulator, for controlling temperature in houses, was the one made in 1878 by Mr. R. L. Guion, of the Guion Automatic Heat Regulating Co., of Elmira, N. Y. At that time, the thermostat used consisted of the rubber bar and steel thermostat, the motor being a light clock work. For a number of years this apparatus was used in one form or another by several companies, but Mr. Guion has since designed a much more simple and accurate thermostat, in which the metals used are brass and steel. The expansion and contraction of the laminæ, with the changes of temperature, moves a circuit closer, which is attached to it, between two electrodes, one being the side which puts the draught on and the other the side which checks the fire. By turning the small thumb-screw at the bottom of the thermostat, as shown in the illustration, it moves the electrodes to the point where the temperature is desired.



THE THERMOSTAT.

carrying the pointer with it, which remains in that position until removed again to some other desired temperature.

The motor used is one sufficiently powerful to handle easily any draught used on a heater. The apparatus, as now placed on the market, is the result of ten years' experience in this line. The apparatus can be attached to hot air furnaces, steam or hot water heaters, and natural gas. In the view showing the thermostat connected to regulate the furnaces, A shows the location of the thermostat on the walls of the room. This is con-



THERMOSTAT CONNECTED TO REGULATE FURNACE.

nected by concealed wires with the battery, B, and clock-work, C, in the cellar. The operation is as follows: When the temperature in the room reaches the point at which the thermostat is set, it connects the circuit through the clockwork. This starts the clockwork and opens the check damper in the smoke pipe and closes the draught in front. When the temperature in the room falls one degree, then the clock-work is again started and reverses the operation, putting on the draught again. The switch, S, is used to disconnect the circuit when the furnace is not in use. This system is especially designed for houses costing from \$2,000 to \$20,000, although as many as twenty regulators have been attached in one building on the cold air boxes, where the building was heated by steam. The company have now one hundred and sixty agencies in the chief cities of the country.

## Old Standard Brands of Roofing Tin.

Messrs. Gummey, Sperring & Co., of Philadelphia, claim that the Alderly, which they sell, is the only perfectly square tin plate in the market, as it is resheared a second time after the sheets come out from between the rollers, and just before going into the dipping pots.

Their "Pennsyl Old Method" are treble-coated hand-dipped plates, and are said to contain all the coating that it is possible for them to contain, while being rolled perfectly true to gauge, and not rolled one gauge heavier, so as to make it appear by the weight of a box that they contain more coating, when in reality it is the extra weight of the iron.

The firm also sell the Patten metallic shingles, which can be put on roofs of any pitch whatever, and on account of their lightness and great durability are said to be fast taking the place of slate, as one square of these metallic shingles or tiles only weighs one-tenth that of slate.

## Hot Water Heaters.

To meet the increasing demand for the Spence Hot Water Heaters in the West, the National Hot Water Heater Co. has established a branch of their business at 41 South Canal Street, Chicago, Ill. Their office will be in charge of Mr. C. B. Thompson, an experienced and thoroughly competent hot water engineer, who will assist in making estimates for fitters and others interested in the subject of hot water heating. The company will carry a full stock of all sizes of their heaters in that city, and are now prepared to furnish two larger sizes than have been heretofore advertised by them.

## THE ALDINE FIREPLACE.

The Aldine patent iron fireplace, having the return draught principle of a hard coal stove embodied in an open fireplace, is shown in the accompanying sectional view. The grate, ash pan, and flues are incased in an iron jacket, forming an air chamber about the radiating surfaces. The cold air from the floor enters through the openings, A, at either side of the hearth, passes around the firebox, B, and flues, E and C, and, becoming heated by contact with these radiating surfaces, rises and passes out into the room through the register at F, thus keeping up a constant and rapid circulation of the air, and distributing the warm air most effectually throughout every part of the room. This fireplace, being in one piece when mounted, can be easily slipped into the opening under any square-faced mantel, the chimney connection being made as with a stove with ordinary stove pipe. This fireplace is made by the Aldine Manufacturing Company, of Grand Rapids, Michigan.

## Good-Looking Houses.

"Look here!" exclaimed Brown, entering the office of his architect, "you've made a nice mess of my house, haven't you?"

"Why, what's the matter?" replied the architect.

"Matter!" returned Brown; "why, the staircase is so crooked that I can't get my furniture upstairs, and there isn't a window in the parlor that you can look out of without using a step-ladder."

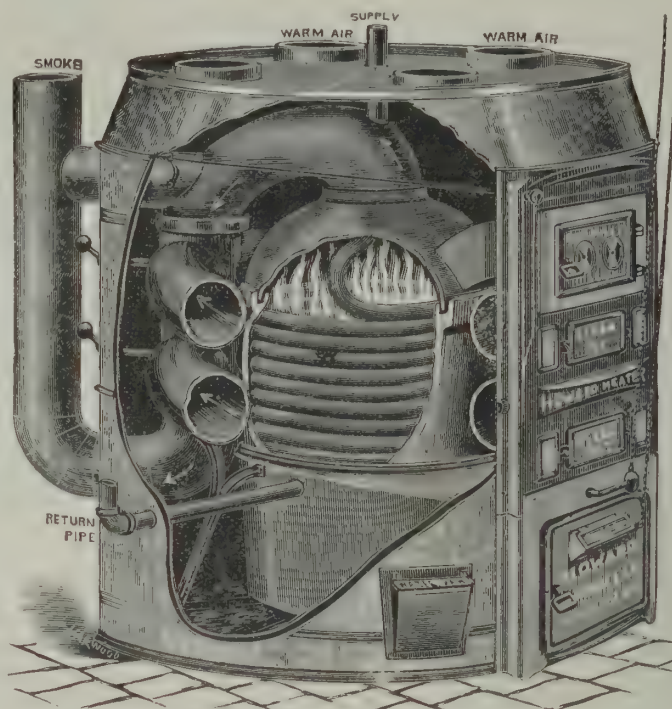
"Well, what of that? Doesn't your house look well from the road?"

"It looks well enough; but, confound it! what does that amount to?"

"Everything, my dear sir; everything. I understand my business, I believe. I am an architect. If you wanted a house that was only comfortable and convenient, why on earth didn't you get a carpenter to draw the plans? Brown, I'm afraid you don't appreciate high art."—*Sanitary Engineering.*

## THE HOWARD COMBINATION HEATER.

A system of hot water and warm air heating designed to be moderate in cost and very effective, while assuring thorough ventilation in a building, has been designed by Mr. Howard, of the Howard Furnace Co., Syracuse, N. Y., a view of the combination furnace be-

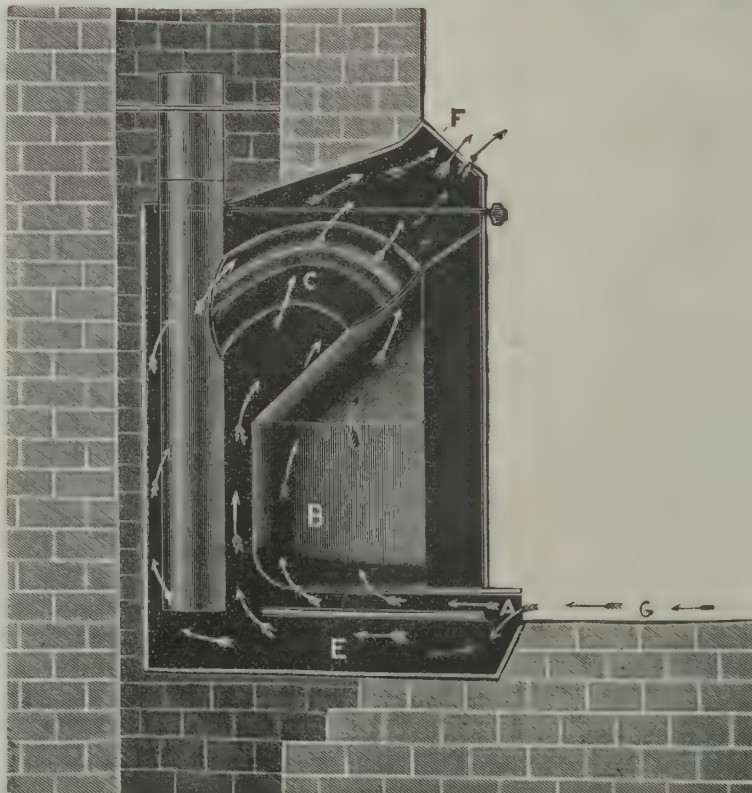


A COMBINATION WARM AIR AND HOT WATER HEATER.

ing shown herewith. The design is to use the warm air from the furnace on the first floor of a building, heating by hot water in the upper and more remote floors through the means of wrought pipe and radiators. The hot water is supplied by a coil placed within the fire pot, the coil being in connection with a supply tank in the top of the house, of a capacity of about ten gallons, the tank also acting as a regulator. This combination can be adjusted to any of the furnaces made by the company.

How many preachers properly appreciate the importance of having their congregations breathe pure air of a comfortable temperature? The heating and ventilation of a church has much to do with the attendance, and more with the condition of the audience and the effect of the preacher's words. Stony indeed is the soil upon which the seed falls when the only ventilation of a church is by way of an open door or window.—*Sanitary News.*

If any of our readers have made an invention for which they have thoughts of taking a patent, they are invited to communicate with Messrs. Munn & Co., the publishers of this paper, who for a period of forty-three years have conducted a most successful bureau in this line. A pamphlet of instructions will be sent free, containing full directions how to obtain a patent, costs, etc. In very many cases, owing to their long experience, they can tell at once whether a patent probably can be obtained; and advice of this kind they are always happy to furnish free of charge. Address Munn & Co., SCIENTIFIC AMERICAN office, New York.



SECTIONAL VIEW OF THE ALDINE FIREPLACE.



# F. W. DEVOE & CO.

(Established 1852)

## PURE MIXED PAINTS

We desire to call attention of consumers to the fact that we guarantee our ready mixed paints to be made only of pure linseed oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fireproof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed oil. Sample cards, containing 50 desirable shades, sent on application.

**FINE VARNISHES,  
WOOD FILLERS,  
WOOD STAINS.**

**ARTISTS' MATERIALS,  
MATHEMATICAL INSTRUMENTS.**

Catalogues of our different departments to responsible parties.

Cor. Fulton and  
William Sts.,  
NEW YORK.

Coffin, Devoe & Co.,  
176 Randolph St.,  
CHICAGO.

SEVEN FOR THE CLARK, BARNSTOWN, N. J. 1888  
EDWARD T. HAFKOPF, ARCHITECT, 1365 5TH AV.

Stained with Dexter Bros' English Shingle Stain.



OUR STAINS are made from the best English Colors and pure Linseed oil with a small proportion of petroleum which serves to preserve the wood as well as the color. They do not contain any "grease" or "stand oil" which has the smell of *Cresote*, and we guarantee that all our samples have been dipped in our original stain. WE CLAIM superiority of color which will not wash off and will retain its brightness long after other stains have faded or turned black. Our Stain has been thoroughly tested by many of the leading Architects in this country during the past four or five years, and we have received many flattering testimonials. We will send a package of Stained Boards, by mail, to any address, on application. These small Sample Boards give but an imperfect idea however of the beauty of the Stain as the effect of Stained Shingles can only be seen in a mass on the house. ONE GALLON OF OUR STAIN will dip about 500 Shingles, or cover about 1500 shingles, when brushed on. Please note number on Sample Boards. We would advise Architects to specify as follows:

"DEXTER BROTHERS' ENGLISH SHINGLE STAIN."

**DEXTER BROTHERS, Sole Manufacturers,**  
55 & 57 BROAD ST., BOSTON, MASS.

Send for copy of Memoranda  
of Specifications.

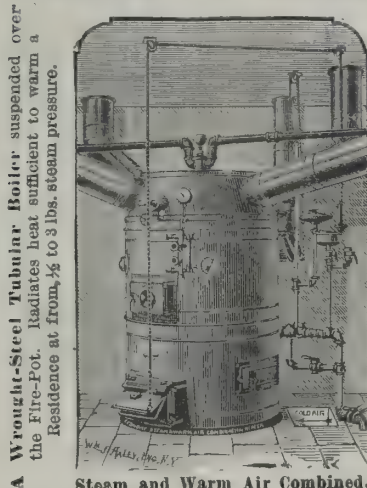
## THE MURPHY TRANSPARENT Wood Finishes,

are manufactured especially for interior and exterior finish of residences, churches, hospitals and other public buildings.

They are being specified by many of the leading Architects throughout the country who have investigated their merits.

**MURPHY & COMPANY,**  
227 BROADWAY,  
New York City.

## ECONOMY COMBINATION HEATER



Wrought-Steel Tubular Boiler suspended over the Fire-Pot. Radiates heat sufficient to warm a Residence at from 1/2 to 3 lbs. steam pressure.

The Original and Only Successful Combination Steam and Warm-Air Heater made.

**WEAK IMITATIONS**  
Attempted by Unprincipled Competitors testify to the merits of our Heaters.

Dealers and Users are Cautioned  
Against buying any apparatus infringing our patents.

MANUFACTURED SOLELY BY

**J. F. Pease Furnace Co.**  
SYRACUSE, N. Y.

206 Water St., New York; 75 Union St., Boston; 177 Randolph St., Chicago; 153 Queen St., Toronto.

SEND FOR CATALOGUE  
Illustrating these Heaters, and also

## THE ECONOMY WARM AIR FURNACES.

## Architects, \* Builders, \* and \* House \* Owners

Should use our **Lead Covered Electric Conductors and Cables** for circuits for Electric Call Bells, Annunciators, Electric Gas Lighting, Incandescent Lighting, or for communication between Residence and Stable, etc., and avoid the vexation and inconvenience of broken, leaky, or grounded circuits. Our Cables are moisture proof and can be embedded in the plaster walls, while the flat cable is specially adapted for arranging along the wainscoting, and staining to match. They are permanent, reliable, and economical.

## Standard Underground Cable Co.

GENERAL OFFICES:  
No. 708 PENN AVENUE, PITTSBURGH, PA.  
Branch Offices:  
Telephone Building, Cortlandt St., New York. G. L. Wiley, Manager.  
139 East Madison Street, Chicago. F. E. Dehenhardt, Manager.

MANUFACTURERS OF  
The **WARING ANTI-INDUCTION** and **BUNCHED CABLES**, and **ACHESON COMPOUND CABLE**.

For Telegraph, Telephone, Electric Light and Power, Underground, Submarine, and Aerial.  
**Light Leaded Cables** (containing one or more conductors) for use in Houses, or for connecting Residence and Stable.  
Insulated Line Wire, Underwriters', Magnet, Annunciator, and Office Wire.  
All Work Guaranteed.

## GLASS.

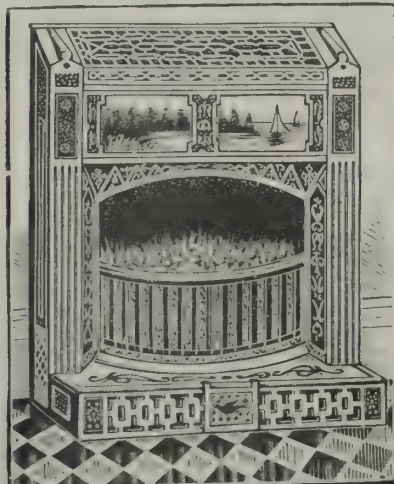
**VANHORNE, GRIFFEN & CO.**  
131 to 137 Franklin Street,  
New York,  
— Importers of —

**French Window & Picture Glass**  
POLISHED AND ROUGH  
**PLATE GLASS**  
Ornamental Glass.

French and German Mirrors.  
Manufacturers of  
**Bent and Beveled Glass.**

**BENT GLASS WORKS,**  
NEWARK, N. J.

## THE ALDINE FIREPLACE.



The Aldine is economical as well as sanitary in its results. It is the only Grate that can be piped to common chimneys, one or more rooms removed from the Grate itself, with as good results as if set in a chimney place. The Aldine secures perfect and slow combustion of fuel, warm floors, constant circulation of warm air, and perfect ventilation. The Aldine has the return draught principal of a hard coal stove embodied in it, and compares with all other grates only as the modern return draught base-burning stove of to-day compares with the direct draught coal stove of 25 years ago. Send for illustrated circular. Address

ALDINE MFG. CO., GRAND RAPIDS, MICH.

## THE LEIBRANDT & McDOWELL STOVE CO. PHILADELPHIA and BALTIMORE.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

It has all the new features combined in one range; namely, a hinged slip plate, allowing the whole surface of fire to be exposed for broiling; a lift-out bottom oven plate—an entirely new feature; the whole bottom of the oven lifts out, enabling the flues to be cleaned, as well as the bottom oven plate itself; it has a front feed door, making it unnecessary to remove covers to put on coal.

As a Brick Set Range, it requires no brick work except the jambs, all the flues being in the body of the range. Therefore it can be set by any bricklayer.

It is made either right or left hand, single oven, with or without water-back, and with or without elevated warming shelf.

We make these ranges either with the Draw-bar shaking grate, Duplex grate, or our Automatic grate, all being interchangeable.

The doors are all fitted with our patent hinge, which insures successful operation both in the oven and fire, the doors always fitting, allowing no escape of heat or gas.

Send for  
**HEATER and RANGE**  
Catalogue.



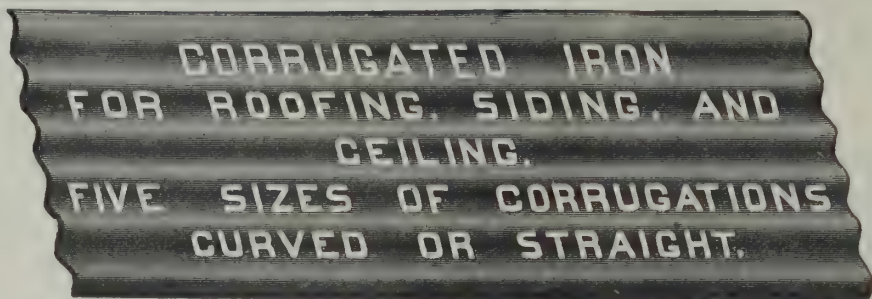


**MORSE ELEVATOR WORKS.**



Morse, Williams & Co.  
(Successors to Clem & Morse)  
Builders of all kinds of  
**PASSENGER & FREIGHT**  
**Elevators**  
Office, 411 Cherry St.  
Works, Frankford Ave., Wilkey and  
Shackamaxon Sts.  
**PHILADELPHIA.**  
New York Office, 168 Liberty St.

**THOMPSON MANUFACTURING CO., CLEVELAND, O.**



We want to Mail you our New Illustrated Catalogue (84 pages), the Finest ever issued by a Roofing Company.



Telephone Call,  
360 Pearl.

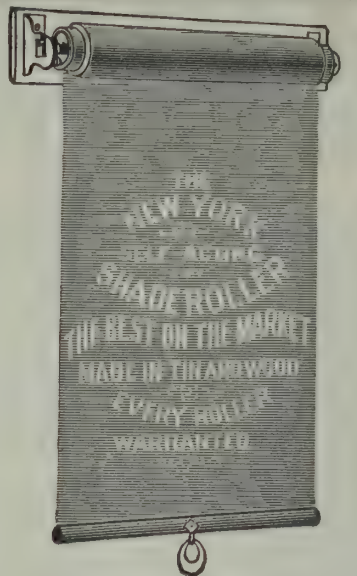
**HENRY H. HILL**  
36 Pearl Street,  
**NEW YORK,**  
MANUFACTURER OF  
**ELEVATORS**  
—FOR—  
Factories, Stores, Warehouses,  
Stables, etc., operated by  
Steam, Hydraulic, Belt, and  
Hand Power.  
Shafting, Hangers, Pulleys,  
etc.



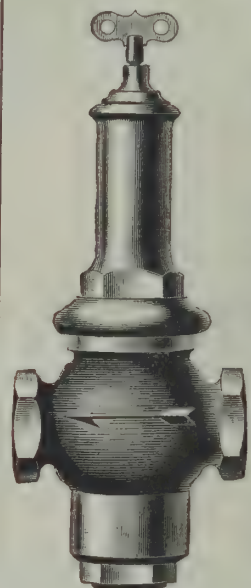
"TIME IS MONEY."

We execute three-fourths of all orders on day received, for we have large facilities and large stocks. You will lose no time or money by delays if you order of

THE CINCINNATI CORRUGATING CO., 150 Eggleston Ave., CINCINNATI, OHIO.



MANUFACTURED BY  
**CUSHMAN BROS. & CO.,**  
BOSTON, MASS.  
All Shades and Upholstery Goods at Bottom Prices.



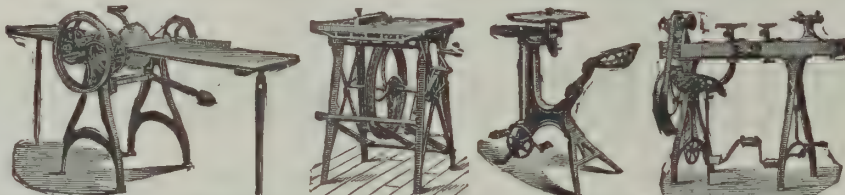
**OUR REDUCING VALVE**

Is the standard used by the American and Southern Cotton Oil Companies and all the Sugar Refineries.

**MASON REGULATOR CO., BOSTON.**

Steam Regulating Devices.

**M. B. SWEZEY,**  
MANUFACTURER OF  
**Improved Dumb Waiters**  
FOR DWELLINGS, WITH AUTOMATIC CATCH,  
**CHICAGO, ILL.**  
120 Twentieth Street,

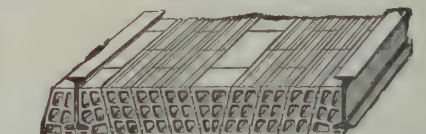


**FOOT-POWER MACHINERY.**  
COMPLETE OUTFITS FOR CONTRACTORS AND BUILDERS.

Machines for ripping, cross-cutting, scroll-sawing, mortising and tenoning, forming edges, grooving, gaining, rabbeting, cutting dados, and turning. Builders use our Hand Circular Rip Saw for the greater portion of their ripping in preference to carting their lumber to a mill five minutes' drive from their shops. The same is true in regard to scroll sawing, mortising, tenoning, cutting stuff for drawers boxes, etc. Builders using these machines can bid lower and save more money from their contracts than by any other means.

**Read the Following Letters from Builders:**

CLARENCE F. LEE, carpenter and builder, Morristown, N. J., says: "I have had one of your Hand Circular Rip-Saws for about three months, and am much pleased with it. Have done the ripping for 15 houses in that time, which is over forty miles through inch boards. Have ripped as high as 3-inch plank. Table is also good for rabbeting; having rabbeted all jambs and sawed all drips for 200 windows."  
ALEX. SHIELDS, Lima Ohio, says: "A few days since we had some 150 small drawers to make for a drug store; the steam power mill wanted 50 cents each for making them. With my foot power machinery I made them, and saved \$25 above good wages on the job. If desired, these machines will be sold ON TRIAL. The purchaser can have ample time to test them in his own shop and on the work he wishes them to do. Descriptive Catalogue and Price List Free.  
**W. F. & JOHN BARNES CO., No. 567 Ruby St., Rockford, Ill.**



(Iron Beam Protection. Patented June 3, 1884.)  
**HENRY MAURER & SON,**  
MANUFACTURERS OF

**FIRE-PROOF MATERIAL**  
Of every description. Hollow Brick made of Clay for Flat Arches, Partitions, Furring, etc. Porous Terra Cotta, Fire Bricks, etc., etc.

Office and Depot, 420 East 23d St., New York.  
WORKS, PERTH AMBOY, N. J.



**WELL**  
Encyclopedia of 700 Engravings of WELL TOOLS, Branch House: 11 and 13 S. Canal St., Chicago, Ills.

**MANAHAN'S PARCHMENT SHEATHING**

Strongest, Lightest, most Waterproof.  
One Dollar's worth covers more ground than same amount of most sheathing. Send for Samples.  
**HALLETT BROS., Sole Agents, 290 Devonshire St., BOSTON.**

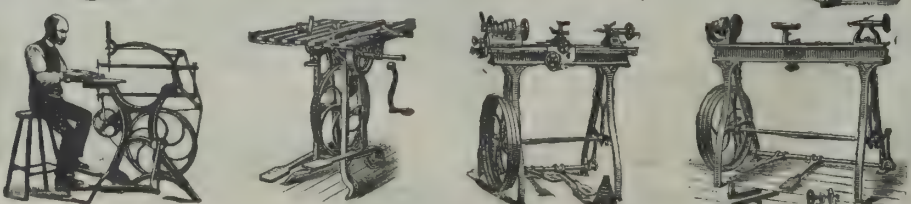
**E. & H. T. ANTHONY & CO., 591 Broadway, N. Y.**

Manufacturers and Importers of  
**PHOTOGRAPHIC INSTRUMENTS, Apparatus and Supplies, OF EVERY DESCRIPTION.**  
Sole Proprietors of the Patent Detective, Fairy, Novel, and Bicycle Cameras, and the Celebrated Stanley Dry Plates.  
Amateur Outfit in great variety from \$9.00 upward. Send for Catalogue or call and examine.  
More than Forty Years Established in this line of business.

**CHAS. E. LITTLE, 59 FULTON ST. New York.**

Silver Medal on Tools Awarded by Amer. Inst. 1886. Medal "Superiority" for  
**W. F. & J. Barnes' Workshop MACHINERY.**  
New York Agency. Factory Prices.

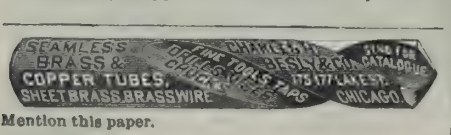
**Patent Foot Power Machinery.**  
The Latest and Most Improved, for  
**Carpenters, Builders, Cabinet Makers and Wood and Metal Workers Generally.**  
Machines for Scroll Sawing, Ripping, Cross-Cutting, Mitring, Rabbeting, Grooving, Gaining, Beading, Variety Moulding, Boring, Mortising, Tenoning, Wood and Metal Turning, Screw Cutting, Etc., Etc.  
Enterprising Mechanics are quick to see the Superior Merit of our Machines.  
Machines sold ON TRIAL if desired. Send for Catalogue and Price List, giving full description, testimonials, etc.  
**THE SENECA FALLS MFG. CO., 276 WATER ST., SENECA FALLS, N. Y.**



**S. ADAMS & SONS, Patent Gang Lath Mill.**  
Made of Iron and Steel. No. of saws, 6; cuts 1 to 5 lath at will; saws lath and pickets at the same time if required; cuts 30,000 to 40,000 per 10 hours; cuts lath, pickets, broom handles, chair stuff, etc. Send for circular No. 22, giving full information, and cash discounts. Price, with legs, \$125, without legs, \$115.  
**S. Adams & Son, George St., Rome, N. Y.**

**CHARTER'S GAS ENGINE.**

2 to 25 H. P.  
The Simplest, most Reliable, and Economical Gas Engine in existence.  
An impulse at every revolution. Perfect steadiness guaranteed for Arc or Incandescent Electric Lights.  
Independent of gas works when desired, and makes its own gas at a cost of 65 cents per M. feet, or about one cent per hour to each indicated H. P.  
A Perfectly Safe Motor for All Places and Purposes.  
New York Agent, JOHN J. BOCKIE, 47 Dey Street.  
Chicago Office and Salesroom, 152 Lake Street.  
For circulars and prices, address  
**Williams & Orton Mfg. Co. P. O. Box 148. STERLING, ILL.**



SEAMLESS BRASS & COPPER TUBES, SHEET BRASS, BRASS WIRE, CHICAGO. Mention this paper.



**OIL WELL SUPPLY CO., Limited.**PITTSBURGH, PA.,  
OIL CITY, PA., and  
BRADFORD, PA.

MANUFACTURE AND SELL ALL KINDS OF

**Tools and Machinery**BOILERS, ENGINES, TUBING, CASING and ROPE  
FOR**Drilling, Equipping, and Pumping Artesian Wells,**And for Everything, Either in Brass, Iron or Wood, for  
Producing, Storing, Conveying or Utilizing

PETROLEUM,

NATURAL GAS,

WATER, or STEAM.

**MOORE'S****AUGER \* BIT \* FILES.****ONE OF THE BEST "LITTLE" TOOLS EVER  
PLACED ON THE MARKET.**This is the only File ever invented that will file all sizes of Auger Bits without filing the screw  
and lip away, and spoiling the tool.

Price per dozen, \$1.40. Price each, postage paid, 15 cts.

WE ARE PARTICULARLY DESIROUS of introducing this File, as we are sure that there will be  
a large demand wherever it is once used. With this point in view we make the following**SPECIAL OFFER.**On receipt of **TEN CENTS** we will forward to any address by mail one of these Files as a  
sample.

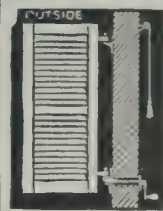
We will not send more than one file to any one address at this price.

The above special offer has proved so advantageous in introduc-  
ing these files, that we have decided to continue it until the 1st of  
January, 1889, but no longer, and we hope every mechanic will see  
fit to take advantage of it.Send 8 cents in stamps for our latest Catalogue No. 12 of Woodworkers' Tools, the most com-  
plete one ever issued; 200 pages, 700 illustrations.**CHAS. A. STRELINGER & CO.,**  
DETROIT, MICH.

ESTABLISHED 1844.

**SAMUEL H. FRENCH & CO.,**  
York Avenue, Fourth and Callowhill Sts.,  
PHILADELPHIA, PA.**PAINT MANUFACTURERS.**Strictly Pure Lead, Zinc and Colors, Dry, in Oil, Japan,  
and Ready Mixed for Use.**PEERLESS  
MORTAR COLORS.****BLACK, BROWN, BUFF, AND RED.****Masons' and Builders' Supplies.**

SEND FOR CATALOGUE AND CIRCULARS.

**MALLORY'S  
STANDARD SHUTTER WORKER**

Opens and closes the blinds without raising the window.

Automatically locks the blinds in any position.

Best and cheapest blind hinge.

Incomparable for strength, durability, and power.

Can be applied to old or new houses, of brick, stone, or wood.

Send for Illustrated Circular and Testimonials.

If your Hardware dealer does not keep them send direct to

**Frank B. Mallory, Flemington, New Jersey.**

"THE WOMEN LIKE IT."

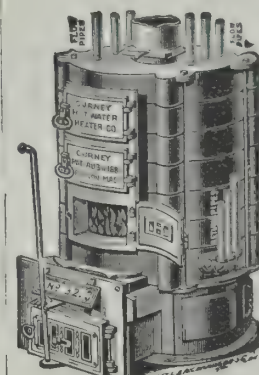
**GURNEY'S HOT-WATER HEATER.**413 EDMOND ST., ST. JOSEPH, MO.,  
June 5, 1888.DEAR SIR:—The winter has been unusually  
severe, and at no time was there any trouble to  
heat the entire house to the desired temperature.  
Have had no doors to keep closed to stop that  
"cold draught." I like the heat and the working  
of the heater in every particular. Another and  
still greater is, the women like it. They can  
manage it and cannot say enough in its praise.  
If I built a house with but two rooms, and wanted  
them heated, would have the "Gurney."  
Yours respectfully,

JOHN M. ARMSTRONG.

Illustrated Catalogue and Testimonial Sheet Free.

**Gurney Hot Water Heater Co.**

No. 237 Franklin St., Boston, Mass.



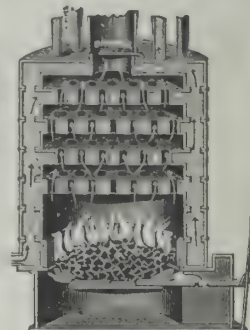
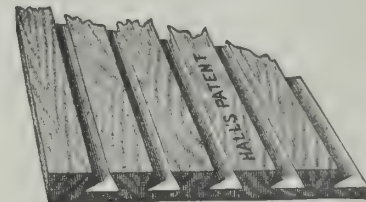
ELEVATION.

New York, M. H. Johnson, 140 Centre St.  
Detroit, T. R. Chase, 31 Edmund Place.  
Portland, Or., W. Gardner & Co., 1343d St.

Selling Agencies:

Chicago, Rice & Whitacre Mfg. Co., 42 & 44 W. Monroe St.  
Charleston, S. C., Valk & Murdock, 16, 18 & 20 Hasell St.  
Covington, Ky., J. L. Frisbie, 526 Philadelphia St.

MENTION THIS PAPER.

**HOW TO BUILD A PERFECT HOME  
WITH VERY LITTLE COST.**USE  
COMBINED  
SHEATHING  
LATH.It makes a cheaper, warmer and stronger house than  
brick or stone. It is a dry and therefore a healthy house.  
The plaster will not crack. Architects and Builders  
specify it all over the country.

ADDRESS

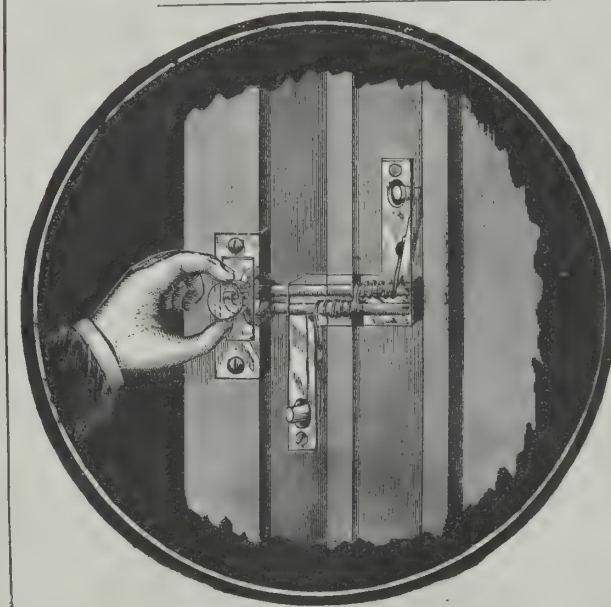
**The Byrkit-Hall Sheathing Lath Co.,**

226-228 LA SALLE STREET, Room 28, CHICAGO, ILL.

For Eastern and New England States, address

**I. G. JENKINS, OSWEGO, N. Y.**

—THE—

**Timby Burglar-Proof  
SASH LOCK  
AND  
VENTILATOR.**One Lock only required for a  
Window. It locks either or both  
sash securely in any position de-  
sired, thereby affording the  
means of Perfect Ventilation;  
also absolute security against  
Burglars and Sneak-Thieves.Its simplicity, automatic ac-  
tion, strength, ventilating quali-  
ties, and adaptability to varying  
thicknesses of sash or inside  
stops, render it more desirable  
than any other Sash Lock now  
offered in the market.Manufactured from the Best Malleable  
Iron, Steel, Brass and Bronze Metal.**Jenkins & Timby,**

Manufacturers,

OSWEGO, N. Y.

**SENECA FALLS PUMP & FIRE APPARATUS WORKS**

**PUMPS FOR ALL PURPOSES**

**RUMSEY & CO. (LIMITED) PROPRIETORS, SENECA FALLS, N.Y. U.S.A.**

**PATENTS.**MESSRS. MUNN & CO., in connection with the publi-  
cation of the SCIENTIFIC AMERICAN, continue to ex-  
amine improvements, and to act as Solicitors of Patents  
for Inventors.In this line of business they have had forty-one years  
experience, and now have unequalled facilities for the  
preparation of Patent Drawings, Specifications, and the  
prosecution of Applications for Patents in the United  
States, Canada, and Foreign Countries. Messrs Munn &  
Co. also attend to the preparation of Caveats, Copyrights  
for Books, Labels, Reissues, Assignments, and Reports  
on Infringements of Patents. All business entrusted to  
them is done with special care and promptness, on very  
reasonable terms.A pamphlet sent free of charge, on application, con-  
taining full information about Patents and how to pro-  
cure them; directions concerning Labels, Copyrights,  
Designs, Patents, Appeals, Reissues, Infringements, As-  
signments, Rejected Cases, Hints on the Sale of Pa-  
tents, etc.We also send, free of charge, a Synopsis of Foreign Pa-  
tent Laws, showing the cost and method of securing  
patents in all the principal countries of the world.**MUNN & CO., Solicitors of Patents,**  
361 Broadway, New York.BRANCH OFFICES.—No. 622 and 624 F Street, Pa-  
cific Building, near 7th Street, Washington, D. C.



**THE PRENTICE METALLIC HIP SHINGLE**

Patented Sept. 21, 1886.  
Excels in durability, economy, and finish. Takes the place of boards or strips; makes water and snow tight joints, with no nails exposed. Will not curl or get loose, and is also applicable to old roofs. Endorsed by leading Architects and Builders. Sample by mail on application.

**RETAIL PRICES.**  
Plain, for Shingle Roofs, - \$3.00 per Hundred  
Painted, for Shingle Roofs, - 3.50 "  
Galvanized Iron, for Slate Roofs, - 7.00 "  
Copper, for Slate Roofs, - 22.00 "  
Liberal Discounts to Dealers and Contractors.  
Orders promptly filled. Address, Box 184.  
METALLIC HIP SHINGLE CO., 516 to 520 Summit St., Toledo, O.

**The Draper Recording Thermometer.**

This thermometer gives a permanent and continuous record in ink of the temperature. The chart indicating hours of the day and days of the week gives the degrees of temperature from 20° below zero to 110° above. All instruments are accurately adjusted and warranted. The record is easily read and absolutely correct. Sold by the leading instrument dealers and opticians throughout the United States and Canada, and by **THE DRAPER MANUFACTURING CO.** Owners of the United States and foreign patents, 132 Front Street, New York. Size 14x20 in. Patented. Copyrighted.

**L. MANASSE,**

IMPORTER AND MANUFACTURER,

88 Madison Street, Chicago, Ill.



ARCHITECTS' AND SURVEYORS' SUPPLIES.

Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.

Improved LEVELS for Builders and Tiling.

Illustrated Catalogues Sent on Application.

JOHN WHEELER,

CARPENTER AND BUILDER

**ORNAMENTAL RUSTIC WORK.**

Medals from American Institute, And other Associations.

P. O. Box 140. Cleveland St., Orange, N. J.

**Anderson & Dickey,**  
ARCHITECTURAL  
**WOOD TURNING**  
—AND—  
Spiral Moulding,  
43 BRISTOL ST.  
BOSTON, MASS.  
Stair Builders' Supplies  
**BALUSTERS.**  
Newels solid or built up.  
Stair Rails of all dimensions  
worked ready to put up.  
Rope Moulding of all sizes,  
Mantels, Office Fittings, etc.  
Correspondence solicited.  
Send two-cent (2c.) stamp  
for illustrated catalogue.

**THE Standard Wood Turning Co.**58 BAY STREET,  
Jersey City, N. J.**MACHINE-TURNED  
BALUSTERS**Various Sizes and Patterns Dove-  
tailed ready for use, with Tait's  
Patent Dovetail.

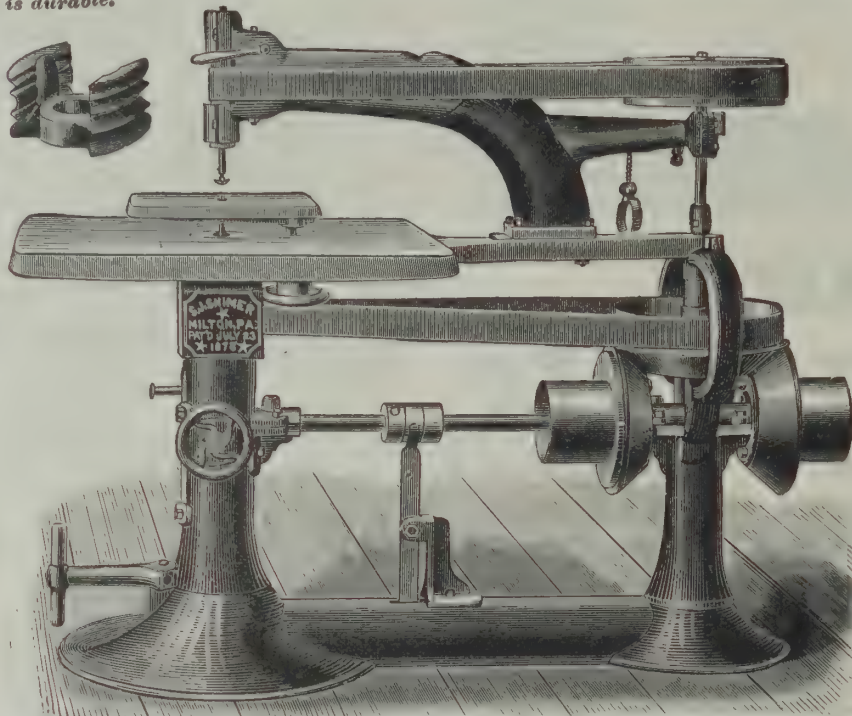
PEDESTAL and TURNED NEWELS.

**STAIR RAILS,**Of all dimensions, worked, ready  
to put up.Send 4c. Stamp for our 32-page  
Catalogue, containing 200 Illustrations  
of Balusters, Pedestal Newels,  
Brackets, Drops, etc.**Shimer's Variety Moulder, with  
Surface Moulding Attachment.**

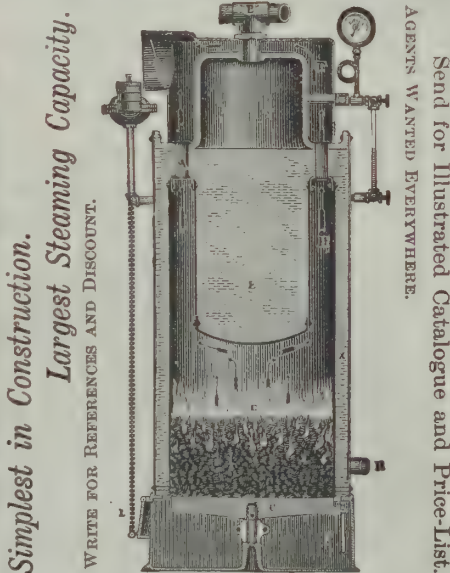
**FOR SINKING** panels with pattern guided by pin that automatically takes its position when you start the Machine, and drops out of the way when you stop it. The Cutter in the overhanging arm of the Machine has a perpendicular adjustment of one inch, and is operated by the handle shown in the cut attached to an eccentric lever that is automatically locked to the one position when at work.

**TO CHANGE** from Surface Moulder to Variety Moulder, disconnect the rod that runs the incline on the T lever and pin it up. Run the housing up by means of the hand wheel until it stands above the belt line, remove the one spindle, substitute the other and set screw it to the housing. Turn the small table back under the arm. Raise the arm, disconnect the shaft that runs the upper pulley, and the Machine becomes an Edge Moulder without having any of its parts unbolted and laid away.

*You never tire of the make up of this Machine, which is as simple and effective as it is durable.*



Reversible Cutters for any shape of mould made to order, and warranted to cut free and easy. For Circulars and full information, address,

**SAMUEL J. SHIMER & SONS,**MANUFACTURER of the SHIMER CUTTER HEADS and SPECIAL WOODWORKING MACHINERY,  
**MILTON, PENN.****Duplex Steam-Heater Co.**Manufacturers under FISKE'S PATENTS,  
10 Barclay Street, New York.Simplest in Construction.  
Largest Steaming Capacity.  
WRITE FOR REFERENCES AND DISCOUNT.AGENTS WANTED EVERYWHERE.  
Send for Illustrated Catalogue and Price-List.**THE "IDEAL"  
PATENT TILE-LINED BATH-TUB.**

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,  
BAKER BUILDING,  
1524 CHESTNUT ST., PHILADELPHIA.

Send for Illustrated Circular and References.

**MAXWELL'S  
Gypsum Paint**

For Whitening and Coloring Churches, Factories, Mills, Dwellings, Barns, Fences, or for any purpose where whitewash or kalsomine is used. Made in a variety of standard colors. Put up in 1/2 and one gallon, also 1/4, 1/8, and one barrel quantities.

A Beautiful, Durable, and Cheap article.

Will stand any climate.

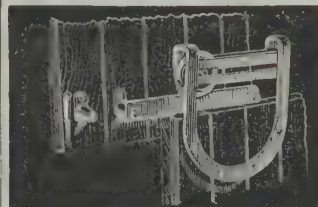
MANUFACTURED BY

**JOHN MAXWELL,**  
1603 OTSEGO STREET,  
PHILADELPHIA.**25% TO 50% SAVING THE MACKAY AUTOMATIC SPRINKLER**

Thermostatic Fire Alarm operated by Electricity. Positive in its action. Easily tested. No attendance required. Endorsed by Underwriters. **The J. C. Mackay Co.,** 76-80 So. Water St., Syracuse, N. Y., U. S. A.

**LANE'S PATENT STEEL DOOR HANGER**

The most perfect Anti-Friction Hanger in the Market.



**BECAUSE** It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

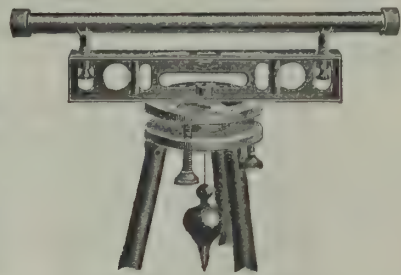
**LANE'S PATENT TRACK** Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

Manufactured by **LANE BROS.,** Poughkeepsie, N. Y.**JOHN H. GRAHAM & CO.,** General Agents, 113 Chambers St., N. Y.

SOLD BY HARDWARE DEALERS GENERALLY.

**ARCHITECTURAL PERSPECTIVES.**

Architects and Builders who have plans which they desire to have put into perspective are informed that we have on our staff a number of experienced artists who make a specialty of this class of work. Prompt attention to orders and moderate charges may be expected. To set up perspectives we need floor plans and elevations. Perspectives in colors also promptly executed.

**MUNN & CO.,** Scientific American Office, 361 Broadway, New York.**LEVELING INSTRUMENT.**

SEND FOR PRICES.

**C. F. RICHARDSON,**  
ATHOL, MASS.,

Manufacturer of Metal Levels.

**No. 11 PLANER & MATCHER**Double Belted and Geared  
Lower Rolls.Special Machinery for Cut  
Work and the latest im-  
proved Woodworking Ma-  
chinery of all kinds.**C. B. ROGERS & CO.,**

Norwich, Conn.

109 Liberty Street,  
New York.**TO ARCHITECTS.**

THE undersigned has had much experience in the making of perspectives from plans and elevations, and will promptly execute any orders, either in ink or colors as desired.

**A. F. LEIGHT,**

361 Broadway, New York.

TERMS MODERATE.

ESTABLISHED 1843.

Manufacturers of

**Stable Fittings and Fixtures.**

IMPROVED and PATENTED.

IRON, BRASS, BRONZED and NICKEL-PLATED

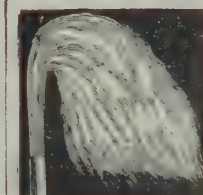
POULTRY YARD APPLIANCES, ETC.

Low estimates furnished to Architects, Builders, Carpenters, Masons, etc.

Catalogue Mailed on Application.

**SAMUEL L. BENT & SON,**

No. 111 Chambers St., New York City.

**ARTESIAN**

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 300 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue. **Pierce Artesian and Oil Well Supply Co.,** 80 Beaver Street, New York.

**LEFFEL'S HOUSE PLANS.**

CONTAINING

Elevations, Plans and

Descriptions of Houses

costing from \$500 to \$3,000, and adapted to families having good taste and moderate means. Including the six prize plans in the *Mechanical News* competition. One oblong quarto, \$2.00.

Sent by mail, postage prepaid, on receipt of the price. Address

**MUNN & CO.,** Publishers of Scientific American,  
361 Broadway, New York.**Instantaneous Water Heater Co.**

Manufacturers of the

**DOUGLASS PATENT**

Instantaneous Water Heater,

FOR

Baths and Domestic Purposes.

Can be used any place where gas and water can be obtained.

210

Illinois St.,  
Chicago.



THE LATEST & BEST IMPROVED  
**BRICK MACHINES**  
FOR BOTH STEAM  
AND HORSE POWER.

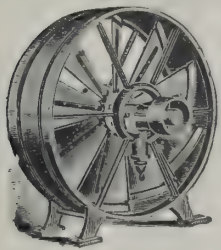
WEIGHT 7000 LBS.  
WEIGHT 7200 LBS.

STEAM-POWER BRICK MACHINE  
WITHOUT GEARING.

STEAM-POWER BRICK MACHINE  
READY FOR PULLEY.

SEND FOR ILLUSTRATED CATALOGUE  
**HENRY MARTIN,**  
INVENTOR, PROPRIETOR,  
AND MANUFACTURER.  
139 CHESTNUT ST.  
LANCASTER, PA., U.S.A.

ALPACER-GU ENG.



Clark's New Drying Exhaust and Ventilating Fans.  
**PATENT ADJUSTABLE WINGS.**  
Capacity Quickly Increased or Diminished.  
**Self-Oiling Bearings. Light Running.**  
**Durable.**  
PRICE LIST FREE.  
GEO. P. CLARK, (Box A), Windsor Locks, Ct.  
JAMES GOLDSMITH, New York Agent, 744 BROADWAY.

**PASSENGER ELEVATORS,**  
MANUFACTURED BY  
**HOWARD IRON WORKS,**  
BUFFALO, N. Y.

The Elevators in the State Capitol, Albany, New York, were built by us, and many others in some of the finest buildings in the country.

**GRAVES' ELEVATORS,**  
**PASSENGER and FREIGHT,**  
MANUFACTURED BY

L. S. GRAVES & SON, Rochester, N. Y.  
BRANCH OFFICE: 46 Cortlandt Street, New York.

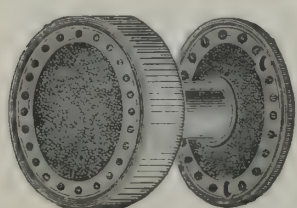
**RICHMOND WEATHER STRIP CO.**  
MANUFACTURERS OF  
**ROWLETT'S INDEPENDENT  
AUTOMATIC COUNTER-BALANCED  
WEATHER STRIP.**

AWARDED BRONZE MEDAL AT CINCINNATI INDUSTRIAL  
(EXPOSITION 1884)

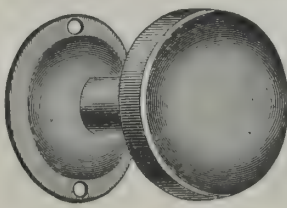
HAS NO SPRINGS, TRIGGERS OR CIRCLE  
IRONS; POSITIVE ACTION; CANNOT GET  
OUT OF ORDER; FITS ANY DOOR.

AGENTS WANTED IN EVERY CITY AND TOWN IN THE U.S.  
SEND FOR CIRCULAR. SAMPLE STRIP, PREPAID TO ANY  
PERSON ON RECEIPT OF \$1.00. ADDRESS  
RICHMOND WEATHER STRIP CO. RICHMOND, IND.  
P.O. Box 282. FACTORY 217 N. 6TH STREET.  
MENTION THIS PAPER.

**HEMACITE.**



Easily the Best and  
Handsomest  
Interior Door-Handle  
Address  
DIBBLE MFG. CO.,  
Trenton, N. J.



THE  
**WELLS PROCESS**  
Rustless Oxide of Iron.  
The Newest and Best Process  
FOR  
**PROTECTING IRON.**  
Special and Exclusive Rights for Sale

**RUSTLESS IRON WATER PIPE**  
SEND FOR CATALOGUE  
**THE WELLS RUSTLESS IRON CO.**  
21 CLIFF STREET NEW YORK



**Mineral Wool**  
FOR  
FIRE-PROOFING,  
DEADENING SOUND,  
and INSULATION of HEAT  
and COLD in  
RESIDENCES,  
COLD STORAGE, and  
REFRIGERATING ROOMS.  
Descriptive Pamphlet and  
Sample Free.  
ADDRESS:  
Western Mineral Wool Co.,  
Cleveland, O.  
St. Louis, Mo.

**ICE and REFRIGERATING MACHINES**  
The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

To Architects,  
Builders,  
and Owners.

Attention is called to Fireproof and Vermin Proof  
**MINERAL WOOL**  
As a Lining in Walls and Floors for preventing the  
Escape of Warmth and the Deadenng of Sound.  
Sample and Circular Free.  
U. S. Mineral Wool Co., 2 Cortlandt Street, N. Y.

**IMPORTANT**  
To Architects, Builders, House-Painters, Decorators, Boat-Builders  
and Yachtsmen desiring an *extremely durable* Finish for Wood.

Are superior to any Var-  
nishes or Wood-Finishes in  
the market, for the follow-  
ing reasons, viz.:  
They possess more  
body, higher luster,  
greater resisting pro-  
perties to atmospheric  
influences, action of  
water and alkali, are  
more elastic, will not  
scratch or mar white,  
and are more durable.



For all classes  
Inside Work,  
Requiring great dura-  
bility, use No. 2 ELAS-  
TICA FINISH.  
For  
Outside Work,  
Requiring extreme  
durability, use No. 1  
ELASTICA FINISH.

WORKS:  
734-740 East 14th Street,  
733-739 East 13th Street,  
199-207 Avenue D.  
**STANDARD VARNISH WORKS,**  
**D. ROSENBERG & SONS,**  
Office, 207 Avenue D,  
Send for Samples and Full Particulars.  
NEW YORK.

**PEERLESS BRICK CO.**  
PHILADELPHIA, PA.  
1003 WALNUT ST.  
WORKS—70 Acres—Old York Road and  
Nictown Lane.

**PLAIN, PRESSED FRONT,  
ORNAMENTAL & MOLDED  
BRICKS**

MADE OF  
**THOROUGHLY TEMPERED CLAY.**  
16,000,000 Bricks Annually.  
5,000,000 Pressed Front Bricks,  
**600 DIFFERENT DESIGNS AND SHAPES.**  
VARIOUS SIZES, COLORS, AND SHADES. } Red, Buff, Drab, Brown, Gray,  
Black, White and Pompeian.  
Orders filled for large quantities of Pressed Front or Face Bricks of any one shade.  
**BRICK FIRE PLACES and MANTELS.**  
ARCHES of all kinds ground and fitted from drawings  
furnished to us. Full size working plans sent with bricks.  
**SPECIAL SHAPES** made from designs fur-  
nished us by Architects. Bricks shipped in cars at  
our works for all parts of the country. Illustrated  
Catalogue and Price List sent on application.



## The Great Architect.

## H. H. RICHARDSON

## AND HIS WORKS.

By Mrs. SCHUYLER VAN RENSSELAER.

With a fine portrait of Mr. Richardson, twenty-six full-page Heliotypes, and over seventy other sketches, full-page and smaller, illustrating Mr. Richardson's works. *The edition is limited to 500 copies.* In a quarto volume, attractively bound. \$20.00.

Mrs. Schuyler Van Rensselaer's great monograph, *Henry Hobson Richardson and His Works*, is one of the most beautiful art books ever attempted in this country, and has the special merit of being American in spirit and substance, in matter and manner, in its genius and in workmanship. In form it is a folio, the page being twelve inches wide by fifteen in height. There are ix and 152 pages of text, thirty-seven full-page illustrations, and nearly double that number in the text. Almost all the full-page illustrations are beautiful heliotypes, making a really splendid gallery of Mr. Richardson's principal works. Whether it would have been possible to find a better biographer for Mr. Richardson than Mrs. Van Rensselaer it is not easy to determine. It is manifest, however, that her work is adequate and satisfying—an extraordinary achievement, which will add to Mrs. Van Rensselaer's fame and give great pleasure to Mr. Richardson's admirers in the profession.—*Boston Beacon*.

## Building and Buildings.

**BUILDING CONTRACTS, LEASES, EASEMENTS, AND LIENS.** By A. PARLETT LLOYD, Esq., of the Baltimore bar, author of "The Law of Divorce." 1 vol. 8vo, cloth, \$4.50; law sheep, \$5.00.

This is the first adequate American treatise ever published on the Law of Building. Mr. Lloyd has made a careful and exhaustive study of the subject, and his work contains reference to and citations from every important English and American case upon matters relating to building. It is a plain, clear statement of the law as enacted by legislation and decided by the courts, and is a work of great value to builders.

\*For sale by all Booksellers. Sent by mail, postpaid, on receipt of price by the Publishers.

HOUGHTON, MIFFLIN &amp; CO., Boston,

11 East Seventeenth Street, New York.

Send 25 cents for a copy of our new book, entitled  
**"HOW BEST TO LIGHT OUR COUNTRY HOMES AND RESORTS."**

Some practical suggestions, emphasized by illustrations of a few that are so lighted.

GILBERT &amp; BARKER MFG. CO., 75 Maiden Lane, New York.

## PLANS and SPECIFICATIONS.

Full plans, specifications, and sheets of details, complete, ready for the builder, may be obtained at this office, for any of the structures illustrated in this publication. We also prepare plans for buildings of every description, including churches, colleges, schools, stores, dwellings, carriage houses, barns, etc.

We are assisted in this work by able architects, and we try to make our estimates reliable, so that the work can be done by any reliable builder at the prices named. Terms moderate.

MUNN &amp; CO., 361 BROADWAY, NEW YORK.

## SEBASTIAN, MAY &amp; CO.,

Manufacturers of and Dealers in

## Hand and Foot Power Machinery

For CARPENTERS, BUILDERS, MACHINISTS, etc.

183 W. Second St., Cincinnati, O.

Write for our New Catalogue, just issued.

E. J. JOHNSON,  
SLATE BLACKBOARDS,  
ROOFING SLATE.

SLATE ROOFERS' SUPPLIES.

HEARTHES, SILLS, LINTELS, STEPS, MANTELS.

Special orders will receive prompt attention. Send for estimates.

Quarry: Bangor, Pa. Office: 18 Burling Slip, New York.

Send for descriptive circular of Indestructible Slate Roof for Flat Roofs only.

OCTOBER, 1888.

## NEW BOOKS.—Now Ready

**Rocks and Soils:** Their Origin, Composition, and Characteristics: Chemical, Geological, and Agricultural. By Horace Edward Stockbridge, Ph.D., Professor of Chemistry and Geology in the Imperial College of Agriculture, Sapporo, Japan. Chemist to the Hokkaido Cho. With 13 full-page plates. 8vo, cloth, \$2.50.

**Stair-Building:** In its various forms and the One Plane Method of *Hand Railing* as applied to drawing Face Moulds, unfolding the center line of Wreaths, giving lengths of Balusters under all Wreaths. Numerous designs of Stairs, Newells, and Balusters—for the use of Architects, Stair Builders and Carpenters. By James H. Monckton. Illustrated by 81 full-page plates of working drawings, etc. SECOND EDITION. With 16 additional full-page plates (97 in all). 4to. \$5.00.

"It may certainly be considered the champion work of its kind, and not only stair builders, but architects, owe you a debt of gratitude for making their labors lighter in this regard."—O. P. HATFIELD, Architect.

**Elements of Analytical Mechanics.** By Col. Peter S. Michie, of U. S. Military Academy. 1887. Complete, including Fluids. 8vo, cloth, \$4.00.

## Recent Publications.

**Photography Applied to Surveying.** By Henry A. Reed, U. S. Army, author of "Topographical Drawing and Sketching." With many illustrations. 4to, cloth, \$2.50.

"Lt. Reed's volume is the best work we know of in the English language."—*Photographic Bulletin*.

**Practical Hints for Draughtsmen.** By Prof. Chas. W. MacCord, Stevens Institute of Technology. 4to, cloth, \$2.50.

"The book is profusely illustrated and, in every respect, deserves to be strongly commended to students of mechanical drawing."—*Mechanical News*.

**A Manual of Steam Boilers, Their Design, Construction, and Operation.** For Technical Schools and Engineers. By Prof. R. H. Thurston. Many illustrations. 8vo, cloth, \$6.00.

"Probably one of the most complete works on Steam Boilers that has ever been issued."—*Manufacturers' Record*.

**Notes on the Compressive Resistance of Freestone, Brick Piers, Hydraulic Cements, Mortars, and Concretes.** By Q. A. Gillmore, Ph.D., author of "Treatise on Limes, Cements, Mortars, etc." 8vo, cloth, \$3.50.

"The work should be in the hands of every mechanic who has to do with the construction of walls. To the Architect and Designer it is simply indispensable."—*Manufacturers' Gazette*.

**The Design and Construction of Masonry Dams.** Giving the method employed in determining the profile of the Quaker Bridge Dam. By E. Wegmann, Jr., C.E., Division Engineer New Croton Aqueduct. Illustrated by types showing the High Masonry Dams of the World. Containing 58 plates showing some Dams. 4to, cloth, \$5.00.

"As a summary of the best and latest results of engineering skill in the construction of masonry dams, this volume will prove of extreme value to engineers whose work or studies lie in that direction."—*Railway Age*.

JOHN WILEY & SONS,  
Astor Place, New York.

Catalogues and Descriptive Circulars free by mail.

## Superior Copper Weather Vanes

GILDED WITH PURE GOLD.

TOWER ORNAMENTS, CHURCH CROSSES, FINIALS, ETC.



Vanes made from any Drawing or Design on Short Notice.

T. W. JONES,

SUCCESSOR TO

CHAS. C. BRIGGS,

V. W. BALDWIN.

Removed from 213 Pearl

Street to

170 &amp; 172 Front St.,

Near Maiden Lane,

NEW YORK.

Illustrated catalogue of over 250 designs, mailed to any address on receipt of a two cent stamp, half the postage.

## Notes and Queries.

(1) A. W. P. says: Will you kindly answer the following questions in your correspondents column of SCIENTIFIC AMERICAN? 1. What is the proper proportion of window space to floor space for a school room? A. About one-third. 2. What is the proper height of windows, on one side of a room only, to width of room? A. About one-seventh. This may be varied. 3. Is the German theory, that light should come over the left shoulder, scientific? A. The light should come over left shoulder.

(2) F. S. asks: What process is the best to fill up the pores of Portland cement tiles or artificial stones? A. We can recommend no process that would be thoroughly satisfactory. Melted paraffine might be tried applied to the tiles while warm, or the tiles might be washed with or dipped in cement and water mixed to the consistency of cream.

(3) O. W. K. asks: 1. How many cubic feet of water gas is required to give the same heat as one pound of ordinary bituminous coal? A. About 15 cubic feet of gas. 2. Also how many cubic feet of air is required to effect the perfect combustion of a cubic foot of gas? A. From 7 to 12 cubic feet of air.

(4) M. N. writes: Is it necessary to have the windows of a school room (heated by hot air, with ventilators around the sides near the floor) down at the top? It is very uncomfortable to have the windows down a foot or more, but our teacher insists on having them so. A. We favor ventilation, and believe that your teacher is right.

(5) G. D. writes: I have an underground ice house with close board floor above. It has become so charged with carbonic acid gas, arising from the leaves with which the ice is covered, that we cannot go down with a lamp, which immediately dies out. I have tried throwing in quicklime, which does very little good. Can you tell me how to expel the gas, as it is very unsafe to go in? A. Slake the lime thoroughly with water before putting it in the icehouse. Use the lime while still fresh. It is very dangerous to descend into a place that cannot support the combustion of a lamp.

(6) J. J. B. asks: What will remove paint from window glass? A. Try solution of washing soda. If this is not strong enough, use caustic soda. These solutions will spot any other paint that they may fall upon.

(7) J. P. S. asks: 1. If there is a remedy to stop show windows from sweating in cold weather. A. Ventilation from the top is the most efficacious method in general use. 2. What will drive away or kill cockroaches that infest dwellings? A. Powdered borax is sometimes very effectual.

(8) G. B. W.—For concrete that does not shrink, use equal parts by measure of Portland or Rosendale cement and clear, sharp sand. Mix quickly to a thin paste with water, and then quickly mix therewith an equal bulk of fine broken stone, put in place and use a large faced hand ram to work the concrete even, with light strokes of the ram. A heavy shovel will answer the purpose for thin concrete. Galvanized iron will not corrode when set in concrete or asphalt composition. Mortar does not corrode galvanized iron. Mortar of lime and sand is cheaper than cement.

THE TIFFANY  
GLASS COMPANY

MEMORIAL WINDOWS

GLASS WORK DECORATIONS

Designs and Estimates submitted.

333-335 Fourth Ave., New York City.

## VALUABLE

## Works of Reference

PUBLISHED BY

J. B. Lippincott Company.

## CHAMBERS'S ENCYCLOPEDIA. VOL. II.

A Dictionary of Universal Knowledge. Edited and Published under the auspices of W. & R. CHAMBERS, Edinburgh, and J. B. LIPPINCOTT COMPANY, Philadelphia. *Entirely Revised and Rewritten.* Complete in ten volumes. Price per vol. Cloth, \$3.00. Cloth, uncut, \$3.00. Sheep, \$4.00. Half Morocco, \$4.50.

"There are more and better illustrations than before. The letter-press, with its bold type and two columns to the page, is more agreeable than that of any encyclopædia; the size of the volume, which has been increased a good deal, becomes its standard character better. 'Chambers's Encyclopædia,' as now revised and augmented, will be the best in standard and popular usefulness, and will be needed, whatever encyclopædia one may have."—*Boston Globe*.

"No other encyclopædia equals Chambers's in popular interest. It is eminently a book for the household."—*Cincinnati Com. Gazette*.

"For some uses, and those the most practical, it is superior to the American or the Britannica."—*Pittsburgh Telegraph*.

"One of the best of moderate-priced encyclopædias for popular use in this country."—*N. Y. Book Buyer*.

## Two New Dictionaries.

WORCESTER'S NEW COMPREHENSIVE  
DICTIONARY.

Entirely new edition. Containing over 48,000 Words in Common Use, with an Appendix of 15,000 Proper Names. New illustrations. Reset from New Type and printed from New Plates. 8vo, half roan, \$1.40.

## WORCESTER'S NEW ACADEMIC DICTIONARY.

Entirely new edition. The *Etymology of Words* a distinctive new feature. Containing all the more Common New Words, together with hundreds of New illustrations. Reset from New Type and printed from New Plates. 8vo, half roan, \$1.50.

"Not so meagre as other cheaper dictionaries; it forms a valuable *vade mecum* for the office or family table."—*St. Louis Republican*.

\*If not obtainable at your Booksellers', send direct to the Publishers, who will forward the book, post-paid, on receipt of the price.

J. B. LIPPINCOTT COMPANY, Publishers,  
715 and 717 Market Street, Philadelphia.

## THE

## American Architect &amp; Building News

An illustrated weekly journal.

Yearly subscription to regular edition,	\$6.00
" " " " " " " " " " " "	7.00
" " " " " " " " " " " "	1.75
" " " " " " " " " " " "	10.00

Bound volumes (cloth), \$9.00 to \$10.50, according to date of issue.

**Fromentin's** (Eugène) *The Old Masters of Belgium and Holland.* 8vo. With eight full-page Heliotypes. Translated by Mrs. Mary C. Robbins. \$3.00.

**Fuller's** (Albert W.) *Artistic Homes in City and Country.* Fourth Edition. *Oil on folio.* 76 full-page illustrations. \$4.50.

**Gardner's** (E. C.) *Homes and all about them.* 3 vols. in 1. Profusely illustrated. 12mo. \$2.50.

**Clark's** (T. M.) *Building Superintendence.* 8vo. With Plans, etc. \$3.00.

**Hoyt's** (William E.) *Household Sanitation.* 16mo. 30c. Paper covers. 15c.

**Home Sanitation.** A Manual for Housekeepers. 1 vol. 16mo. 50c.

**Langley's** (Samuel Pierpont) *The New Astronomy.* Royal 8vo. Gilt top and rough edges. Richly illustrated. \$5.00.

**Morse Collection of Japanese Pottery** (The). By Sylvester Baxter. 4 full-page Heliotypes and numerous Vignettes. Folio, in paper covers. \$1.00.

**Morse's** (Edward S., Ph.D.) *Japanese Homes and Their Surroundings.* 8vo. With 300 illustrations, \$5.00. Half-calf, \$9.00. New Library edition, \$3.00. In half-calf, \$6.00.

**Picturesque Sketches.** Statues, Monuments, Fountains, Cathedrals, Towers, etc. 1 vol. oblong folio. \$1.50.

**Index** (Decennial) to Illustrations in the American Architect and Building News. 1876-85. 8vo. \$2.00.

**Ware's** (Professor William R.) *Modern Perspective.* A treatise upon the Principles and Practice of Plane and Cylindrical Perspective. 1 vol. 12mo. With Portfolio of 27 plates. \$5.00.

Sent, post-paid, on receipt of price.

TICKNOR & CO.,  
BOSTON.

## The Old Bangor Slate Company

F. C. YARNALL, President,  
PHILADELPHIA.J. S. MOYER, Sec. & Treas.,  
BETHLEHEM, PA.

This Company is the original operator in the Bangor Valley, and continues to manufacture the Blue Roofing Slates which have become so celebrated for fineness of texture and uniformity of color.

The special attention of Architects and Builders is called to the fact that this Company has perfected a system of preparing Slates with Sawn Edges, of suitable size and curve for Towers and Domes, as may be desired.

Working Drawings should be furnished to secure the best results.

Address correspondence to the Company's office at BETHLEHEM, PA.





## Starrett's :. Latest :. Divider.

A FIRST-CLASS TOOL AT A LOW PRICE.

This cut represents a well made, nicely finished Divider, with auxiliary Caliper legs, which, together with a common pencil, may all be used interchangeably with the arms, forming valuable combinations. Using one of the inside Caliper legs with either one of the points, or with a pencil, forms an excellent Hermaphrodite.

A simple but valuable device for locking the arms firmly is obtained by the knurled nut between the arms, against which a helical spring acts. After the fine adjustment is made, the nut is turned back, pressing the spring in its chambered seat, and locking the arm firmly, thus remedying the weak point in wing Dividers, which are no stiffer than the adjusting spring. The head and arms are made from malleable iron, the rest of steel. The points are hardened and warranted first-class. The smallest size is 7 inches long. By adjustment of points becomes 9 inches, and will scribe a 22 inch circle. Will caliper 11 inches outside and 13 inches inside. The second size is 9 inches. By adjustment of points becomes 12 inches, and will scribe a 30 inch circle, and caliper 14 inches outside and 16 inches inside.

The Divider will be sold without caliper legs when so ordered.

L. S. STARRETT, Athol, Mass.

Send Stamp for complete Illustrated Catalogue of Fine Tools.



## HINE'S ELIMINATOR

FOR EXTRACTING

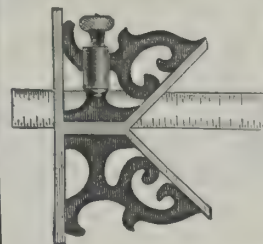
OIL, GREASE and DIRTY WATER from EXHAUST, and WATER from LIVE STEAM before entering the Heating Pipes and Radiators.

Enhancing heating capacity. Doing away with unpleasant odor incident to old system, and returning the condensation to boiler free from all injurious properties.

Also Manufacturers of

DAMPER REGULATORS and REDUCING VALVES.

HINE & ROBERTSON, 41 Cortlandt St., N. Y.



## STANDARD TOOL CO.

ATHOL, MASS.

MANUFACTURERS OF

The Celebrated Chaplin Try and Center Square, Standard Steel Rules, Steel Caliper Rules, Universal Bevels, Caliper Gauges, Improved Surface Gauges, Bevel Protractors, Depth Gauges, Screw Pitch and Center Gauges, Hardened Steel Squares, Graduated Steel Squares, Spring Calipers, Pliers, Straight Edges, etc., etc.

WRITE FOR ILLUSTRATED CATALOGUE AND PRICE LIST OF FULL LINE.

## NEW YORK SAFETY DUMB WAITER FIXTURES

Patented United States, April 19th, 1887; in Canada, May 18th, 1887.



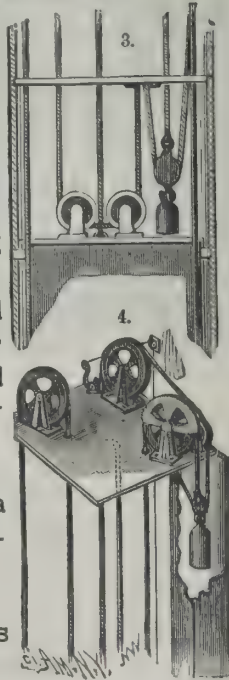
The MOST COMPLETE, SIMPLE and ABSOLUTELY SAFE WAITER made. Provided with SAFETY ROPE, AVOIDING ACCIDENT. ENTIRELY NOISELESS, and moves with perfect ease.

FIXTURES ONE SIZE ONLY, adapted to any size waiter. Can be adjusted by any CARPENTER or MECHANIC. DIAGRAM and FULL DIRECTIONS ACCOMPANY EACH SET.

HANDSOMELY BRONZED, and packed ONE SET in a BOX. Sold by the Hardware trade.

PRICE, 15.00.

For catalogue address the manufacturers.



THE EDWARD STORM SPRING CO., Limited, Poughkeepsie, N. Y.

or, JOHN H. GRAHAM & CO., Sole Mfrs. Agents, 113 Chambers Street, New York.

See September and October issues of this Journal for Illustrations of Cottages in

## "ROCHELLE :. PARK,"

NEW ROCHELLE, N. Y.

Health, Comfort, and Refinement.

### Location.

"ROCHELLE PARK" is a beautiful tract of 70 acres, in the historic village of New Rochelle, N. Y., 17 miles from New York, on the N. Y., N. H. and H. R.R., only five minutes' walk from the station; overlooks the Sound, and combines every desirable requisite for a suburban home.

### Travel Facilities.

Thirty-four trains run daily between New York and New Rochelle. The time between stations is 40 minutes, and commutation \$67 per year.

### Natural Features.

The soil of "ROCHELLE PARK" is gravelly, and the surface rolling, by which perfect drainage is secured. Beautiful trees, many of great age and size, add to its attractions. One of the most competent landscape engineers has planned its drives, walks, lawns, etc., with unusual breadth and freedom of design, and so secured the most satisfactory park effects. Each lot is 100 x 200 feet.

### The Entrance Gate.

But 400 yards from the station, is a striking and beautiful design, and gives the idea of a large private estate rather than that of a public park.

### Terms.

Liberal inducements offered to desirable purchasers. Large percentage can remain on bond and mortgage at 5 per cent.

Rochelle Park is not a land scheme, is not a speculation, and is not a monopoly. As a place of quiet, refined, and convenient suburban residence, Rochelle Park is unsurpassed.

For prospectus and further particulars apply to

H. B. STOKES, New Rochelle, N. Y., or 156 and 158 Broadway, New York.



## Warren's Natural Asphalt Roofing.

Superior to all others for Flat Roofing.

Over 20,000,000 square feet used within 10 years.

This Roofing is not injuriously affected by atmospheric agencies and will not waste or become brittle by evaporation, as with goods made from Coal Tar.

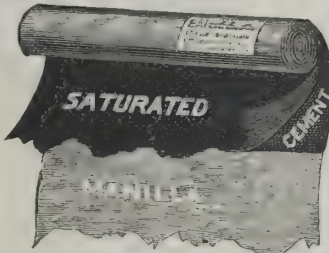
### "COMPOSITE" FELT.

For Roof Foundations.

A two-ply, composed of one layer of saturated Felt and one of manilla-rope paper, cemented together. Combines durability and strength with lightness and pliability, and is absolutely impervious to moisture; for use under slate, shingles, etc., it is especially valuable, since, as soon as the sun comes upon the roof, the cement contained in the sheathing closes tightly around the nails that have been driven through it, and forms of the sheathing itself a complete water-proof covering.

Send for samples and Circular No. 2.

WARREN CHEMICAL & MFG. CO. No. 114 John Street, New York.



## GLASS

PHILLIP SEMMER GLASS CO. LTD.  
PLATE, SHEET & LOOKING GLASS DEPOT  
No. 12 & 14 DESBROSSES ST.  
WRITE FOR QUOTATIONS. NEW YORK.

Franklin L. Carter Chas. M. Wilkins E. Ward Wilkins

ESTABLISHED 1867

## PARTRICK & CARTER.

MANUFACTURERS OF AND DEALERS IN EVERY DESCRIPTION OF

## ELECTRICAL SUPPLIES

SOLE PROPRIETORS OF THE PATENT NEEDLE ANNUNCIATORS AND BURGLAR ALARMS

WE MAKE A SPECIALTY OF

BELLS, DISQUE LECLANCHE BATTERIES GAS-LIGHTING APPARATUS

AND A FULL LINE OF

SUPPLIES FOR ELECTRIC BELL WORK

WE PUBLISH CATALOGUES OF ALL OUR MANUFACTURES AND WILL FORWARD TO ANY ADDRESS UPON APPLICATION.

WHEN APPLYING FOR CATALOGUES PLEASE STATE WHETHER ELECTRIC BELL OR GENERAL ELECTRICAL SUPPLY CATALOGUE IS WANTED, AND IF IN THE TRADE INCLUDE BUSINESS CARD FOR DISCOUNTS.

114 SOUTH SECOND STREET.

PHILADELPHIA, PA.

## ADAMANT

WALL PLASTER.

MANUFACTURED BY

Adamant

Manufacturing

Company.

OFFICE

63 EAST GENESEE STREET,

SYRACUSE, N. Y.

## The New, Cheap, and Only Superior Substitute for Common Plaster.

It is hard as marble, and will last as long as the building.

It does away with the warping and shrinking of doors and casings, it not being necessary, as with common plaster, to saturate the building with water.

It costs but little more than lime plaster, and its superior qualities make it immeasurably cheaper.

It saves waiting several weeks or months for the building to dry out. A room finished one day can be occupied the next.

It does not crack or fall off, even in case of leakages.

It is applied easily by any good mason.

It is the only material with which repairing can be done neatly and "to stay."

For Prices and Estimates, or Further Information, Apply to or Address the Company or to their Licensees,

For Pennsylvania, KEYSTONE PLASTER CO., 233 No. 23d St., Philadelphia,

or, " " 59 9th Street, Pittsburgh, Pa.

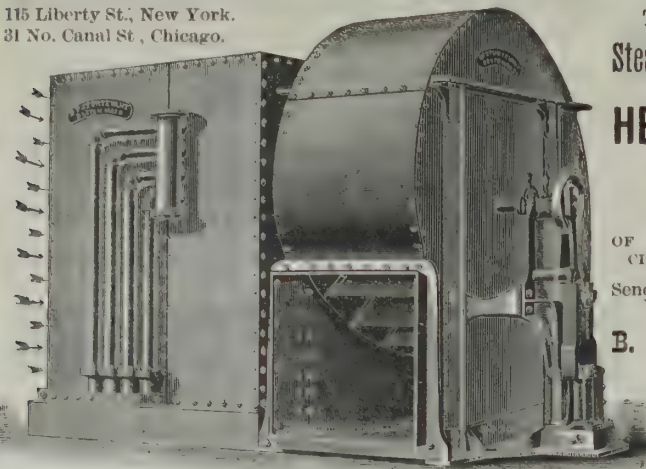
For Massachusetts and Rhode Island, BAY STATE ADAMANT CO., 164 Devonshire St., Boston, Mass.

For Connecticut, CONNECTICUT ADAMANT CO., 480 Grand Avenue, New Haven, Conn.

For New Jersey, NEW JERSEY ADAMANT CO., 61 Passaic Avenue, Harrison, N. J.



115 Liberty St., New York.  
31 No. Canal St., Chicago.



**THE STURTEVANT**  
Steam Hot Blast Apparatus  
FOR  
**HEATING and**  
**VENTILATING**  
**BUILDINGS**

OF ALL KINDS, BY A FORCED  
CIRCULATION OF WARM AIR.  
Send for Illustrated Treatise on  
Ventilation and Heating.

**B. F. STURTEVANT,**  
BOSTON, MASS.

BRANCHES:  
New York. Chicago.

**"PERFECT"**

TRADE MARK

**Hot Water**  
**Heater.**



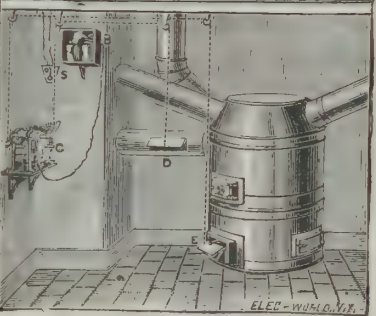
**Hot Water**, as a medium for heating **Private and Public Buildings**, is largely engrossing the attention of the **public**, as being more satisfactory and certain in its operation, and more easily managed than **Steam**. Having constructed a **Hot-Water Heater** that we can recommend to Architects and Builders, we beg to call your attention to the "Perfect" Hot-Water Heater, descriptive circulars of which we have mailed.

These Heaters contain more features for saving fuel and labor, and are better adapted for heating Dwellings, Offices, Schools, and Public Buildings, than any of the other makes of Hot-Water Heaters. By reason of their enormous heating capacity and increased square feet of boiler surface, economy in fuel, and positive circulation, they are the only positive and rapid circulating Hot-Water Heaters made. At a test, made the 19th of January, 1888, at the works of the A. A. Griffing Iron Co., Jersey City, N. J. (manufacturers of the "Bundy" Radiators), where all the leading makes of Hot-Water Heaters have been tested, more power was developed, with less fuel, than any heater ever tested there.

Send for circulars. (Mention Scientific American.)

**Richardson & Boynton Co., Mfrs.,**  
232 and 234 Water Street, N. Y., and 84 Lake Street, Chicago.

## The Guion Automatic Heat Regulator



**AUTOMATIC, ECONOMICAL, PRACTICAL!**  
THE TEMPERATURE OF YOUR HOUSE PERFECTLY UNDER YOUR CONTROL.

CORNELL UNIVERSITY, ITHACA, N. Y., April 23, 1888.  
GUION AUTOMATIC HEAT REGULATING CO.

Gentlemen: I am pleased with your Regulator and think that it has great merit. Yours respectfully,

AND, D. WHITE.

If you have a Heater in your house, or are building a home, write us for a circular. We want an agent in every town and city of the United States and Canada. Electricians and Furnace Dealers, write for terms. Correspondence is solicited from Architects, Builders, and Manufacturers of Furnaces, Steam and Hot Water Heaters. Address

**The Guion Automatic Heat Regulating Co.**  
**ELMIRA, N. Y.**

A shows the location of the thermostat on the walls of the room. This is connected by concealed wires with the battery Band clock-work C, in the cellar. The operation is as follows: When the temperature in the room reaches the point at which the thermostat is set, it connects the circuit through the clock-work. This starts the clock-work and opens the check damper in the smoke-pipe, and closes the draft in front. When the temperature in the room falls one degree, then the clock-work is again started and reverses the operation, putting on the draft again. The switch S is used to disconnect the circuit when the furnace is not in use.

## THE BOYNTON FURNACE CO.

207 & 209 WATER STREET, NEW YORK;  
47 & 49 DEARBORN STREET, CHICAGO, ILL.,

—SOLE MANUFACTURERS OF—

Boynton's "New Gas Tight" Self-Clearing Hot Air  
Furnace with Hot Water Combination.

Patented October 11th, 1887.

THOROUGHLY TESTED, AND NO EXPERIMENT!



Is an apparatus in which all the desirable features of the "New Gas Tight" Hot Air Furnace are retained, and in addition thereto, increased facilities for perfectly heating the parts of a building that may be too remote from the furnace to heat economically with hot air.

It consists of a Combination with the "New Gas Tight" Furnace of a Hot Water Heater so arranged inside of the furnace as to utilize a greater portion of the fuel consumed without decreasing the efficiency of the furnace as a hot air generator.

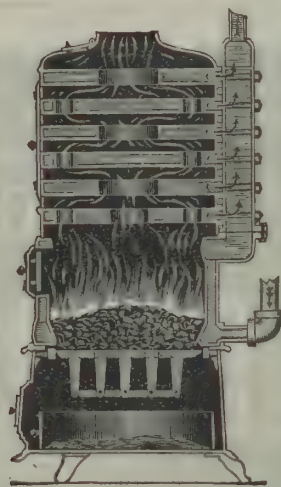
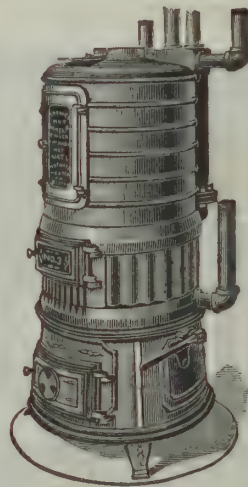
The principal part of the building is heated by hot air, while the far off, inaccessible rooms are heated by the hot water system. The HOT WATER HEATER is made of Cast Iron, and will last as long as any other part of the furnace.

It is absolutely safe; no possibility of an explosion, the water being open to the atmosphere; it is simple, requiring no more skill to operate it than a Hot Air Furnace.

Rooms on the same floor as the furnace may be heated by the hot water circulation; it can be used to heat conservatories, thus saving the expense of a separate heater for that purpose.

It insures perfect ventilation with pure air from out doors; a feature not attained by the direct heating system with all Hot Water or oil Steam.

The special features of our Combination Hot Air and Hot Water Furnace are fully covered by Letters Patent, and all persons are warned against infringement of the same.



SEND FOR DESCRIPTIVE CIRCULARS.

**National Hot Water Heater Company,**

MANUFACTURERS OF

**The Spence Hot Water Heaters,**

191 Fort Hill Square, Boston, Mass., and 41 South Canal St., Chicago, Ill.

## USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,

**MUNN & CO., 361 Broadway, New York.**

## THE BRIDGEPORT WOOD FINISHING CO

G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN.

NEW YORK BUSINESS OFFICE, 96-98 MAIDEN LANE, MANUFACTURERS OF

**WHEELERS PATENT WOOD FILLER.**

**BREINIG'S LITHOGEN SILICATE PAINT.**

**LITHOGEN PRIMER, WOOD STAINS**

**SILEX FLINT AND FELDSPAR.**

PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.

## THE IMPROVED

**Auburn Boiler**

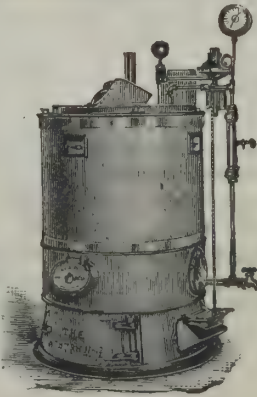
—FOR—

**Steam or Hot Water.**

**AUTOMATIC, SELF-FEEDING, PORTABLE.**

Requires attention but once in from twelve to twenty-four hours. Fuel magazine surrounded by water. Self-locking shaking grate. Waste of coal impossible. No dust. No gas.

**Woodcock & Co., Auburn, N. Y.**



HEATER.

## THE

**Woodcock Patent Shaking Grate,**

FOR

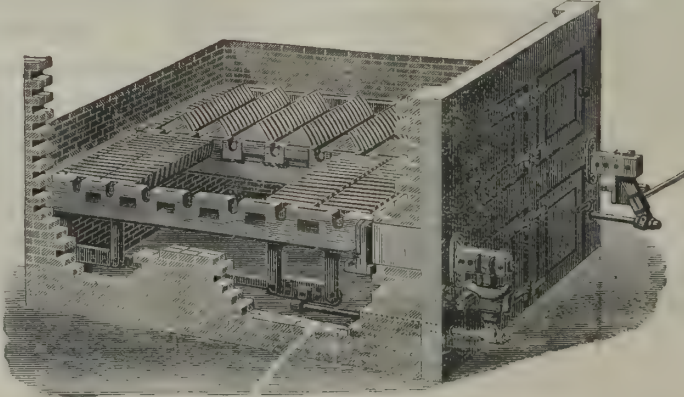
**BOILER FURNACES**

OF ALL DESCRIPTIONS.

Saves its cost in a year, supplanting all other shaking grates. No waste of coal. No burnt or broken grates. Self-locking, and as nearly automatic as a grate can be made.

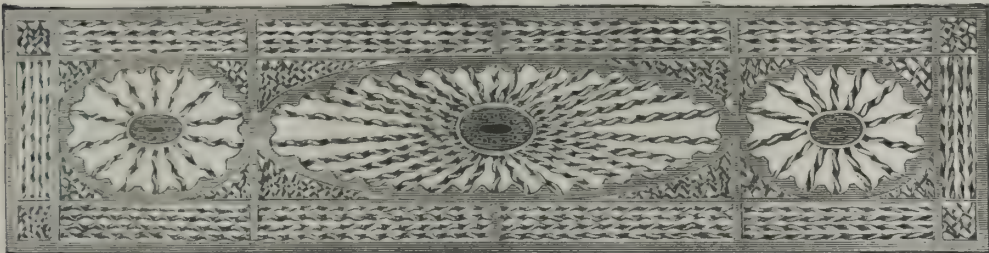
Send for Illustrated Catalogue.

**Woodcock & Co., Auburn, N. Y.**



WOODCOCK PATENT SHAKING AND DUMPING GRATE.





That Beautiful, Ornamental and Decorative Woodwork  
FOR DOORS, TRANSOMS, ARCHES AND WINDOW, KNOWN AS  
**MOORISH FRET WORK,**  
IS MANUFACTURED ONLY BY  
**C. S. RANSOM & CO.,**  
**CLEVELAND, O.**

There is no limit of design into which this work can be made. It is made of any domestic or imported woods, finished, natural, stained, or in white and gold or bronzes. All leading decorating, drapery, or furniture houses will supply you. Patented as an article of merchandise Sept. 15, 1885.

New York Office, 5 West 27th Street.

EDWARD FORD, PREST.  
A. PITCAIRN, VICE-PREST.

E. L. FORD, SECY.  
JOHN F. SCOTT, TREAS.

**PITTSBURGH PLATE GLASS CO.,**  
**CREIGHTON, PA.,**  
MANUFACTURERS  
**POLISHED PLATE GLASS.**

Ground and Rough Plate Glass for Floors and Skylights.  
Three-sixteenths thickness, made expressly for fine residences.  
**LARGE AND WIDE GLASS A SPECIALTY.**  
The Largest Plates of Glass in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and in many New York buildings, were manufactured at our works.

**IMMENSE PRODUCTION.**

The combined production of our two factories is 260,000 square feet per month. The largest production of any factory in the world, which enables us to fill our orders promptly.  
The high reputation and unprecedented large sale of glass made by this company since its organization is due entirely to its superior quality, NATURAL GAS alone being used throughout both works as fuel.

CORRESPONDENCE SOLICITED.

Works No. 1, **CREIGHTON, PA.**  
Works No. 2, **TARENTUM, PA.**

WESTERN UNION WIRE AND TELEPHONE CONNECTION IN GENERAL OFFICE, CREIGHTON, PA.

**THE AMERICAN GARDEN** NEW YORK.

*In the country, 'tis true, ye have woods, gardens, springs, and brooks that may entertain the eye, but these are all mule, and there's no edification without discourse.—ERASMUS.*

Two Months 10 cts For Intro-duction. \$1 A Year Now. \$2 A Year After Jan. 1.

FLOWERS, FRUITS, TREES,  
VEGETABLES: PROFIT, PLEASURE,  
HEALTH: FOR ALL WHO LIVE IN THE COUNTRY.

The largest, handsomest, most valuable gardening magazine in all the world is The American Garden, of New-York. Its writers are practical, successful gardeners, fruit-growers, florists, investigators, and amateurs. It comprises the old *Horticulturist* of Downing and the *Gardener's Monthly* of Meehan. It is practical, beautiful, and finely illustrated. It is valuable to the country gentleman, amateur, professional man, and merchant with small place or house lot in country, town, or village, to every man and woman who loves growing things.

For introduction where unknown the magazine will be sent **two months** for **10 cts.** Subscription price, **\$1.00** a year; **to be raised** on Jan. 1st to **\$2.00** on account of further improvements. Previous to Jan. 1st, subscriptions received at present low rate (\$1.00 a year).

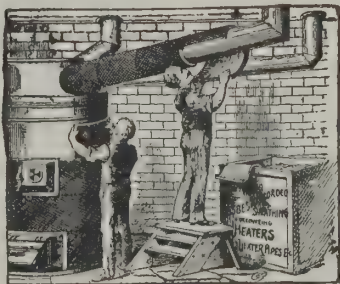
**THE AMERICAN GARDEN, 1 Year:**

<b>FREE</b>	A Year's Subscription to SCI. AM. ARCHITECT'S EDITION to the 1st, 15th, 25th, 50th, 75th, and 100th persons, sending us this Coupon and a Year's Subscription to THE AMERICAN GARDEN, either alone or in club as per next column.	With any \$4.00 periodical, \$4.60	Published in U. S., not sold by subscription.	2.00
		“ “ 3.00 “ 3.60		
		“ “ 2.00 “ 2.50		
		“ “ 1.50 “ 2.10		
		“ “ 1.00 “ 1.85		
		“ “ 1.50 book 2.25		
		“ “ 1.00 “ 1.75		
		“ “ 2.00 “ 2.70		
		“ “ 1.25 “ 2.00		

The above offer is good only to Jan. 1st.

**E. H. LIBBY, Publisher, 751 Broadway, New York.**

EDWIN LEE BROWN, Pres't.  
**The Western Sand Blast Co.,**  
Ornamenters of Glass for  
**VESTIBULE DOORS,**  
**BANK & OFFICE COUNTERS,**  
Manufacturers of Advertising  
Glass Signs.  
Sand Blast & Embossed Rail-  
road Glass a specialty.  
N. W. Cor. Clinton & Jackson Sts.,  
**CHICAGO, ILL.**  
Telephone 4085.



**H. W. JOHNS' ASBESTOS COVERINGS.**  
FIRE-PROOF, NON-CONDUCTING  
FOR FURNACES, HOT-AIR PIPES, ETC.  
33 PER CENT. OF FUEL SAVED.  
DESCRIPTIVE PRICE LIST, FREE BY MAIL.  
**H. W. JOHNS MANUFACTURING CO.,**  
SOLE MANUFACTURERS.  
ASBESTOS ROOFING, BUILDING FELT, ETC.  
SECTIONAL PIPE & BOILER COVERINGS, STEAM PACKINGS, ETC.  
LIQUID PAINTS, FIRE-PROOF PAINTS, COATINGS, ETC.  
87 MAIDEN LANE, NEW YORK.  
CHICAGO. PHILADELPHIA. LONDON.



SEALS WITH OR WITHOUT WATER  
**F. E. CUDELL'S**  
**Patent Sewer-Gas**  
**and Back-water Trap,**  
For Wash-Bowls, Sinks, Bath and Wash Tubs,  
204 SUPERIOR ST., CLEVELAND, O.



**The Hartsfeld Furnace & Refining Co.**

OFFICE AND WORKS:  
**90 & 92 THORNTON ST.,**  
**LOCK BOX 515. Newport, Ky.**  
IN OPERATION SINCE 1885.  
CHAS. L. HARTSFELD, President & Gen'l Manager.  
B. W. KEIM, Secretary.  
Manufacturers and Patentees of Improved Cupola  
Furnaces for Superior Wrought Iron and  
Aluminum Process Steel Castings.  
Patentees and Builders of the most economical Copper,  
Silver, and Lead Ore Smelting Works,  
with Metal Saving, Fume Condensing,  
Oxidizing Wet Condenser.  
Smelters and Refiners of White and Red Lead,  
Refuse, Tailings, Kiln Cleanings, Waste  
Paint, Sweepings, Drummings, Dross, Cry-  
olite, Matres, Ores, and Concentrates.  
Assaying and Analytical work in all its branches.  
Samples sent by mail or express, carefully tested by  
reputable chemists. Charges reasonable.  
We are now prepared with enlarged facilities to erect  
any desired capacity SMELTING WORKS, ready for  
operation for the above named, complete within 30 days  
notice of order.



**WOOD FLOORS**  
**BOUGHTON AND TERWILLIGER**  
25<sup>th</sup> STREET FIFTH AVE. HOTEL  
UNDER

Screw Plates. Adjustable Die.  
Send for CATALOGUE F. F. F.  
**WELLS BROS. & CO., GREENFIELD, MASS.**  
MANUFACTURERS OF  
Screw Cutting Machinery and Tools for Machinists,  
Carriage Makers, and Blacksmiths' Use.

**VIOLIN OUTFITS.**  
Consisting of Violin, Box, Bow, and  
Teacher, sent to any part of  
the United States on 1  
to 3 days' trial before  
buying.  
**Violin Outfits**  
at \$4, \$8, \$15, and \$25 each. Send Stamp for beau-  
tifully illustrated 36-page catalogue of Violins, Guitars,  
Banjos, Cornets, Flutes, Strings, all kinds, Harmonicas,  
Organ Accordeons, Music Boxes, etc. Lowest prices.  
Mail orders a specialty. **C. W. STORY, 26 Cen-  
tral Street, Boston, Mass.**



Eight Foot Eave Trough and Gutters.  
**HATTEN, GALPIN & CO., BINGHAMTON, N. Y.**



**HATTEN, GALPIN & CO.**



## WILLER'S PATENT INSIDE SLIDING BLINDS

ARE ACKNOWLEDGED THE  
STANDARD SLIDING BLINDS  
OF THE COUNTRY.

They are used in preference to any other  
by the  
**LEADING ARCHITECTS.**

THEY ARE THE ONLY SLIDING BLINDS GIVING  
Universal Satisfaction.

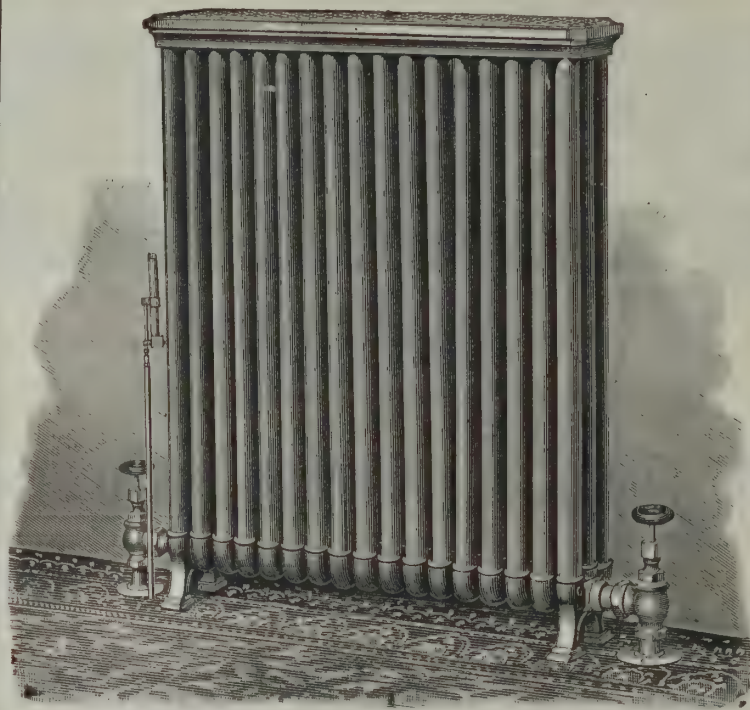
For full particulars, send for our new catalogue No. 8, Architects' and Builders' edition.

**WILLIAM WILLER,**

Sole Manufacturer,

Fourth and Cedar Streets, Milwaukee, Wis.  
**AGENTS WANTED EVERYWHERE.**

State your business when writing for catalogue or agency.



**"OUR OWN" RADIATOR**  
**BROOMELL & SANKS, York, Pa.**  
STEAM HEATING ENGINEERS.

Buildings of any size or description fitted in the best manner, and satisfaction guaranteed. Send for circulars.

## The "ROYAL"

Hot :: Air :: Furnace.

MANUFACTURED BY

**H. GILBERT HART & CO.**

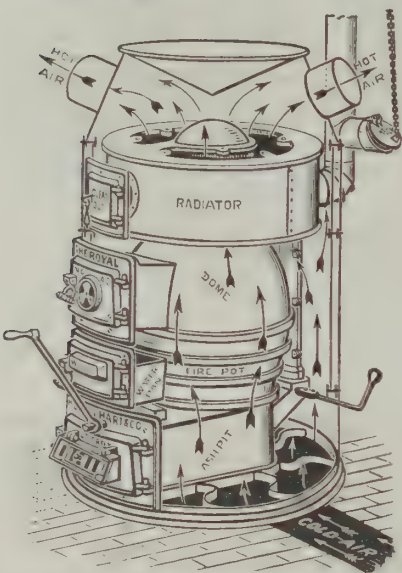
UTICA, N. Y.

SEND FOR CATALOGUE.

DUPLEX GRATE.

GAS TIGHT.

A STRICTLY FIRST-CLASS  
FURNACE.



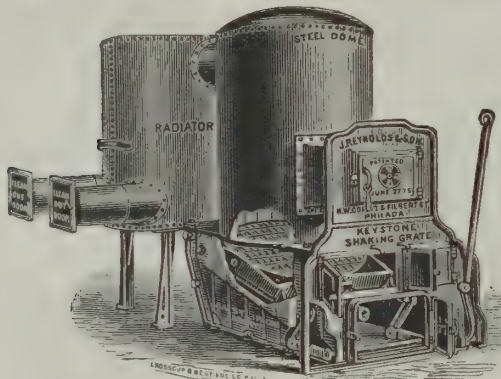
"The Best is the Cheapest."

"A Perfect Furnace at Last."

**Keystone Steel Furnaces,**

**Air Tight Steel Furnaces,**

Manufactured by **J. REYNOLDS & SON,**  
13th and Filbert Sts., Philadelphia.



These Furnaces are supplied with **THE "REYNOLDS CLINKER CUTTING GRATE"** with Patent Dumping Attachment, the best **LABOR** and **FUEL SAVING** invention ever applied to **HEATING APPARATUS**. It is perfection. The Grate can be dropped and cleaned off with closed doors, thus preventing all dust. These Furnaces are perfectly **GAS, SMOKE** and **DUST TIGHT**.

SEND FOR CIRCULAR.

**A NEW CATALOGUE**  
OF  
**A VALUABLE PAPERS**

Contained in **SCIENTIFIC AMERICAN SUPPLEMENT**, sent free of charge to any address.

MUNN & CO., 361 Broadway, New York.

**ICE-BOATS — THEIR CONSTRUCTION** and management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT**, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

## E. N. Gates System of Hot Water Heating



Scale 1/2 in. to Foot.

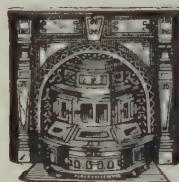
See AMM

Is the only Hot Water System having the Tank in the Cellar, which supplies the highest radiator with water. Parties having large buildings to heat, and church and school heating committees, should address

**E. N. GATES,**

Box 1504.

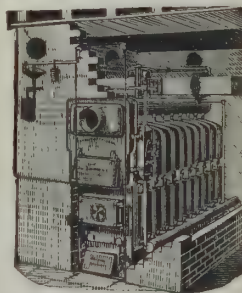
**Fitchburg, Mass.**



**BIBB'S** Celebrated Original  
**BALTIMORE**  
FIRE-PLACE  
**HEATERS**

To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world. **THE B. C. BIBB STOVE CO.** Stove Founders, Baltimore, Md. **HARLEIZED SLATE MANTELS** Send for Circulars and prices.

**Steam & Hot Water Heating Apparatus**  
For Public Buildings, Residences, Etc.



**Our Specialties:**  
The Union Hot Water Radiator;  
Gold's Patent Sectional Boiler;  
Mill's Patent Safety Boiler;  
Reed's Cast-Iron Radiators; In-direct Pin Radiators.

**The H. B. Smith Co.**  
137 Centre St.,  
New York.  
Foundry, Westfield, Mass.  
Send for Circulars.

Manufacturers and Dealers in Parquet and Inlaid Floors, Wainscoting, Etc.

**J. DUNFEE & CO.,**  
**Wood Carpet and Weather Strips**  
OF ALL KINDS,

102 Washington Street, - CHICAGO.

SEND FOR CATALOGUE.

Factory, 204 to 212 South Clinton Street.

**HARTMAN'S PATENT**  
**INSIDE SLIDING WINDOW BLIND.**



Is the most popular Blind in America. Architects and Builders prefer it to any other for merit, style, convenience and economy. It always gives satisfaction.

The only blind that is furnished with an automatic burglar proof lock, free of charge.

Agents wanted everywhere.

Send for illustrated Catalogue and prices to

**Hartman & Durstine,**

WOOSTER,

Ohio,

Mrs. for U. S. A.

**Withrow & Hillock,**

TORONTO, Can.,

Mrs. for the Dominion of Canada.

**ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield.** With directions for construction. Four engravings. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT**, 59. Price 10 cents. To be had at this office and of all newsdealers.

**The New Catalogue of Valuable Papers**

contained in **SCIENTIFIC AMERICAN SUPPLEMENT**, sent free of charge to any address.

MUNN & CO., 361 Broadway, N. Y.



## "Alsop" Warm-Air and Combination Warm-Air and Steam Furnace

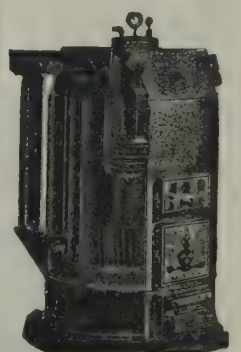
THE BEST HEATER IN THE WORLD. HAS NO EQUAL IN ECONOMY OF FUEL.

Has been tested against several of the best Furnaces in the market, and always produced from 25 to 40 per cent. more heat from a given amount of fuel than any of its competitors. Easily operated, easily cleaned and perfectly gas-tight.

**IN OFFERING** this Furnace to the public, I wish to call attention to the fact that this is no modification of any other Furnace manufactured, simply differing from others in the use of a different Radiator, placed upon the top of the Fire-Pot, but is a new departure in the way in which it uses the products of combustion before they escape to the chimney, and also in the manner in which the air, which eventually passes out of the Registers, is checked in its direct passage, and retained between hot plates until it has been thoroughly heated. Inasmuch as the efficiency of any furnace depends upon the amount of Radiating surface it contains, that which offers the largest Radiation in proportion to the size of the fire pot will give the greatest amount of heat for the smallest consumption of fuel.

This Furnace is made for Hot-Air alone or with Steam Attachment; also for Hot-Air and Hot-Water Circulation.

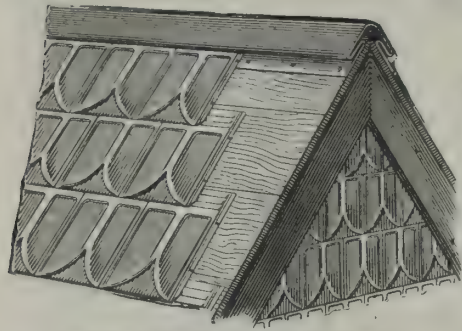
Manufactured by the **ALSOP FURNACE AND STOVE CO., 35 & 37 West Water St., Syracuse, N. Y.**





## THE CORTRIGHT ROOFING TILES AND SHINGLES.

Ridge Coping, Hips, Valleys, etc., also Fire-proof Ceiling or Siding Plates.



Our Gothic Shingle and Plain Ridge Coping.

**TILES.**  
NEW PRINCIPLE. Our METAL TILES put on from the COMB DOWNWARD. MAKE THE MOST HANDSOME AND ABSOLUTELY STORM-PROOF METAL PLATE COVERING IN USE.

**SHINGLES.**  
Gothic Pattern. The BEST SHINGLE ever offered to the trade. Can be laid more QUICKLY and EASIER than any other. HANDSOME, FIRE-PROOF, and PERFECTLY STORM-PROOF. Architects, builders, and owners endorse our whole system of roofing.

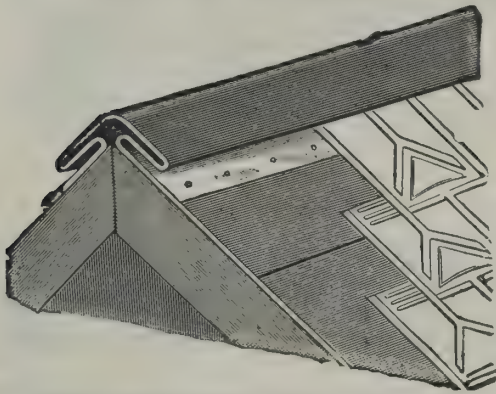
Illustrated Catalogue mailed to any address on application.

WESTERN OFFICE,  
605 Main St.,  
Kansas City, Mo.

Cortright Metal Roofing Co.  
Cor. Broad & Race Sts.,  
PHILADELPHIA, PA.



Shield Tiles as laid on roof with Roll Ridge Coping



Walter's Patent Standard Metallic Shingles.

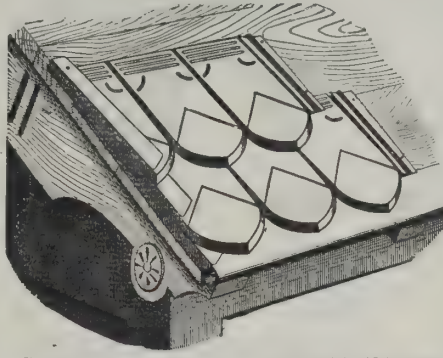
### WHOLESALE AGENTS.

W. W. MONTAGUE & Co., San Francisco, Cal., Pacific Coast.  
PHILLIPS & BUTTOREFF MFG. CO., Nashville, Tenn.  
MCDONALD, KEMP & Co., Toronto, Sole Agents, Canada.  
KNISELY & MILLER, Chicago, Ill.  
J. J. WALTERS, Denver, Col.  
JEROME TWICHELL & Co., Kansas City, Mo.

## Metallic Shingles.

Twenty-nine awards of merit attest their superiority, which consists of a perfect lock with no cleats, springs, or exposed joints.

A practical, durable, fire-proof, and ornamental roof covering, equalled by none; fully guaranteed. References furnished in every city and town of importance in the United States and Canada.



Cooper's Patent Queen Anne Metallic Shingles.



THE NATIONAL SHEET METAL ROOFING CO.,  
510, 512, 514, 516, 518 & 520 East 20th St., New York.

## Tirrill's Equalizing Gas Machines.



The only machine in the world that can make this white, smokeless flame with an ordinary Gas Burner.  
SEND FOR CIRCULARS.

**TIRRILL'S EQUALIZING GAS MACHINE**  
Produces this exact flame with any open burner of suitable size. The only machine in the world that can do it. No Argands or adjustables required.  
Makes Standard, Uniform, White, and Absolutely Smokeless Gas.  
For circulars and information address  
**TIRRILL GAS MACHINE CO., 39 Dey Street, New York.**

## SEALED PROPOSALS.

November 13, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 11th day of December, 1888, for the labor and materials required in the completion of the interior finish of the U. S. Court House and Post Office building at Fort Scott, Kansas, including plumbing, gas fitting, etc., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Wichita, Kan.; Detroit, Mich.; Cincinnati, O.; and Indianapolis, Ind.; the Builders' and Traders' Exchanges at Chicago, Ill.; Louisville, Ky.; and Kansas City, Mo. Each bid must be accompanied by a certified check for \$500.00. The Supervising Architect will furnish a limited number of the specification and drawings at five dollars a set, upon receipt of that sum in post office money order, drawn to the order of the Treasurer of the United States. WILL. A. FRERET, Supervising Architect.

November 17, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 15th day of December, 1888, for the labor and materials required in the completion of the interior finish of the Court House, Post Office, etc., at Rochester, N. Y., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Baltimore, Md.; Cincinnati, O.; and Rochester, N. Y.; Master Builders' Exchange, Albany, N. Y.; Mechanics' and Traders' Exchange, New York City, and the Builders' Association Exchange, Buffalo, N. Y. Each bid must be accompanied by a certified check for \$500.00. The Supervising Architect will furnish a limited number of copies of the specification and drawings at \$5 a set, upon receipt of that sum in post office money order, drawn to the order of the Treasurer of the United States. WILL. A. FRERET, Supervising Architect.

November 16, 1888. Sealed Proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 8th day of December, 1888, for the labor and materials required in the completion of the Approaches, and Post Office Screen for the U. S. Court House and Post Office at Fort Smith, Arkansas, in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' and Traders' Exchanges, at Chicago, Ill.; Louisville, Ky.; and Kansas City, Mo.; the Builders' Exchange, Memphis, Tenn.; the Mechanics' Exchange, St. Louis, Mo.; the Mechanics' Dealers' and Lumbermen's Exchange, New Orleans, La.; and Office of Custodian Court House and Post Office, Little Rock, Ark. Each bid must be accompanied by a certified check for \$500.00. Upon receipt at this office of a Post Office Money Order, in amount one dollar, drawn to the order of the Treasurer of the United States, parties will be furnished with copies of the plans and specification, to a limited number. THOS. D. FISTER, Acting Supervising Architect.

November 6, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 6th day of December, 1888, for the labor and materials required in the erection and completion of the Post Office, Custom House, etc., at Wilmington, N. C. (heating apparatus and approaches not included), in strict accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Baltimore, Md.; Cincinnati, O.; and Charleston, S. C.; Builders' and Traders' Exchanges, Chicago, Ill., and Louisville, Ky.; Virginia Mechanics' Institute, Richmond, Va.; and Mechanics' Dealers' and Lumbermen's Exchange, New Orleans, La. Each bid must be accompanied by a certified check for \$500.00. The Supervising Architect will furnish a limited number of copies of the specification and drawings at five dollars a set, upon receipt of that sum in Post Office money order, drawn to the order of the Treasurer of the United States. THOS. D. FISTER, Acting-Supervising Architect.

November 14, 1888. Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 11th day of December, 1888, for the labor and materials required in the erection and completion of the extension of the United States Court House and Post Office building at Charleston, W. Va., in accordance with the specification and drawings, copies of which may be seen at this office, the office of the Superintendent, the Builders' Exchanges at Baltimore, Md.; Cincinnati, Ohio, and Pittsburgh, Pa.; Builders' and Traders' Exchanges, Chicago, Ill., and Louisville, Ky.; and at the Mechanics' Institute, Richmond, Va. Each bid must be accompanied by a certified check for \$500.00. Upon receipt at this office of a post office money order in amount \$500.00, drawn to the order of the Treasurer of the United States, parties will be furnished with copies of the plans and specification to a limited number. WILL. A. FRERET, Supervising Architect.

## THE ANDERSON

PRESSED FACE, SHAPE  
AND ORNAMENTAL  
BRICK,

In Red, Buff, Brown, Drab, Old Gold, Obsidian, Pink, Black, White, Garnet, Blood Stone, Onyx, Mottled, Drused, Marbled, Roman, Ashlar, etc., are pronounced by Architects, in strength, texture, uniformity of size, color, shades, perfect shape, angles, and lines, the finest in the world, surpassing everything in the art.

### THE ANDERSON COMPANIES

are the largest manufacturers in fine grades of PRESSED BRICK in this country or abroad.

Architects and Builders can obtain illustrated catalogue and any desired information, on application to the nearest Company.

CHICAGO ANDERSON PRESSED BRICK CO., Office, 189-191 La Salle St., Chicago.

NEW YORK ANDERSON PRESSED BRICK CO., Office, 132 Mangin St., New York.

NEW ENGLAND ANDERSON PRESSED BRICK CO., Office, 50 Bromfield St., Boston.

### HYATT

## HOUSE FILTERS.

Over 1,000 of them operating daily in residences producing continuously

BRIGHT, SPARKLING WATER.

Hyatt Pure Water Company,

18 Cortland Street, New York.



**METAL AND TOOLS**  
Wood Workers' SCROLL SAWS, BORTISERS, LATHES, FORMERS, MACHINERY  
We carry in Stock all the  
**LEADING Foot Power**  
**VERY LOW PRICES!**  
Machines.  
Send stamps for large Illus. Catalog  
**JOHN WILKINSON CO., 55 State Street, CHICAGO.**



## ARCHITECTS

SHOULD ALWAYS SPECIFY

MUELLER'S

### Water Pressure Regulators

where hot and cold water is used, to prevent high pressure on boilers, and insure against bursting of pipes. Gives a uniform pressure throughout the building.

Write for catalogue and prices.

H. MUELLER MFG. CO.,  
220 & 222 East Main St.,  
DECATUR, ILL.



**THE BIRGE**  
**ECCLIASTICAL**  
**DECORATIONS**

STUDIED FROM THE MURAL  
PAINTINGS OF

NOTRE DAME MANUFACTURED IN  
PAPER-HANGINGS

M. BIRGE & SONS CORRESPONDENCE  
BUFFALO N. Y. SOLICITED

J. RAYNER,  
ST. DOMINGO

MAHOGANY.

NEW YORK:

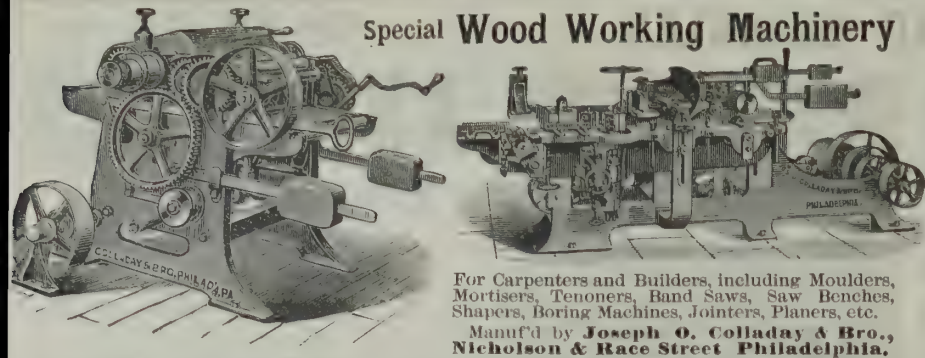
Foot East Houston St.

CHICAGO:

Fulton and Morgan Sts.



Special Wood Working Machinery



For Carpenters and Builders, including Moulders, Mortisers, Tenoners, Band Saws, Saw Benches, Shapers, Boring Machines, Jointers, Planers, etc.  
Manuf'd by Joseph O. Colladay & Bro.,  
Nicholson & Race Street Philadelphia.

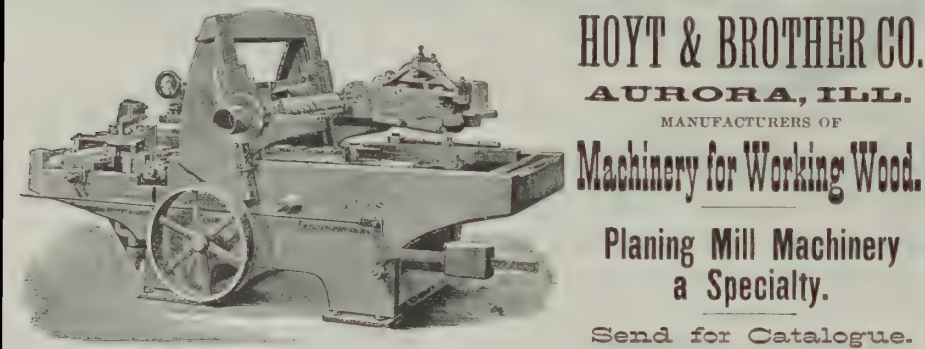
Woodworking Machinery, Planers and Matchers, Pony Planers, Hand Matchers, Solid Plate and Segment Re-Saws.



PLANER AND MATCHER.

SIDING SAW.

CONNELL & DENGLER, Rochester, New York.

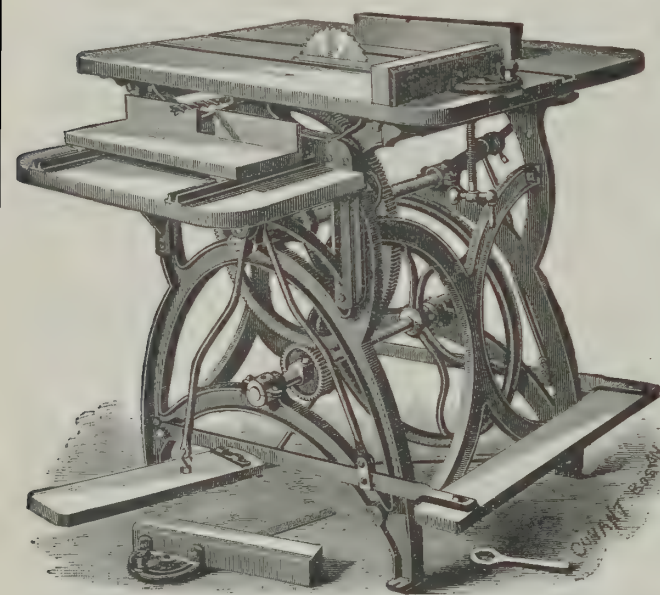


HOYT & BROTHER CO.  
AURORA, ILL.  
MANUFACTURERS OF

Machinery for Working Wood.

Planing Mill Machinery  
a Specialty.

Send for Catalogue.



MARSTON'S  
Hand & Foot Power  
Circular Saw.

Iron frame 36 inches high. Top 80 x 40 inches, centre part off iron with planed grooves on each side of saw for cutting off gauges to slide in. Ripping gauge slides in iron groove. Steel shafts. Gears are all machine cut from solid iron. Boring table and side treadle. Two 6-inch saws and two cranks with each machine. Weight 350 pounds.

Send for price list.

J. M. Marston & Co.

Cor. Appleton & Tremont Sts.,

BOSTON, MASS.

COMBINED

Universal Wood Worker and Molder.

Two machines on one frame, driven by one countershaft, and arranged so that they can be run together or separately.

Address,

The Egan Company,

—BUILDERS OF—

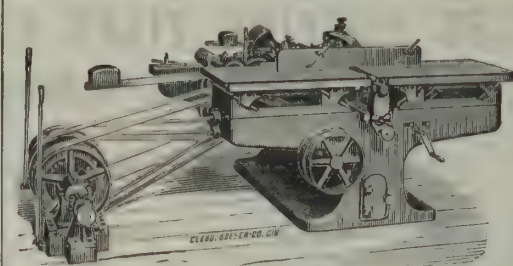
WOOD WORKING MACHINERY,

209 to 229 W. Front St., Cincinnati, Ohio, U. S. A.

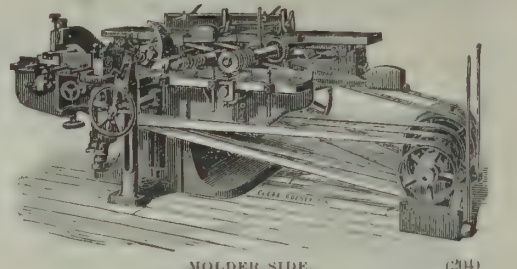
We build the largest and most complete line of improved Wood Working Tools in the U. S. for Carpenters, Builders, Planing Mills, and General Wood Workers.

Complete Outfits Furnished.

Write for Catalogue and Quotations.



WOOD WORKER SIDE.



MOLDER SIDE.

(24)



DECORATIVE LATTICE

ART TO ORDER  
FURNITURE  
CUTTING & DeLANEY



Sectional Panel Ornamental Grille Work.

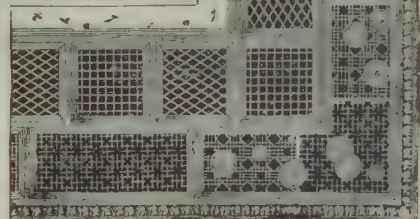
CUTTING & DeLANEY,  
Buffalo, N. Y.,  
ARTISTIC  
Wood Workers.

East Indian, Japanese, and Moorish

Decorative Lattice.  
Special Designs To Order.

FINE CARVED  
Furniture.

Piece of Border Ceiling of Decorative Lattice.



E. P. WILCE & CO.,

MANUFACTURERS OF

DOORS, SASH AND BLINDS

FRAMES, MOULDINGS, BRACKETS, TURNINGS, Etc.

Every Description (in Hard Wood or Pine) of

Stair Work and Interior Finish, Mantels, Sideboards, Pulpits, Pew-Ends, Office Counters, Store Fixtures.

Corner 22d and Throop Streets,

CHICAGO.



BOUGHTON & TERWILLIGER  
235 ST. FIFTH AVE. HOTEL  
N.Y.

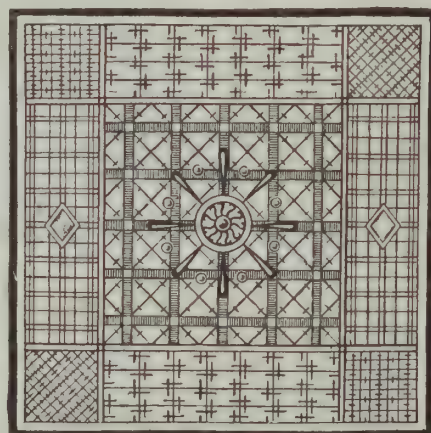
MANAHAN'S

Waterproof Parchment,  
Strongest and Lightest Sheathing.

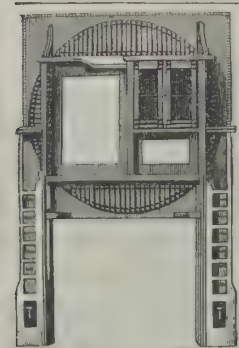
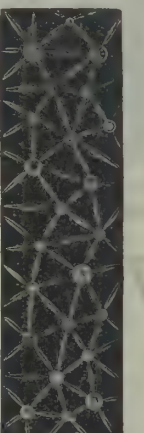
One Dollar's worth covers more ground than same amount of most sheathing. Send for Samples.

HALLETT BROS., Sole Agents,  
290 Devonshire St., BOSTON.

Centre Piece of Ceiling Pattern of Japanese Lattice.



Buffalo, N.Y.



Mankey Decorative Company,

Incorporated Sept. 9, 1885.

Williamsport, Pa.,

CAPITAL \$100,000.

—MANUFACTURERS OF—

Artistic Wood Decorations for Public and Private Buildings

MOULDINGS, PANELS, CEILINGS, WAINSCOTINGS, etc.

WOOD MANTELS and DOORS A SPECIALTY.



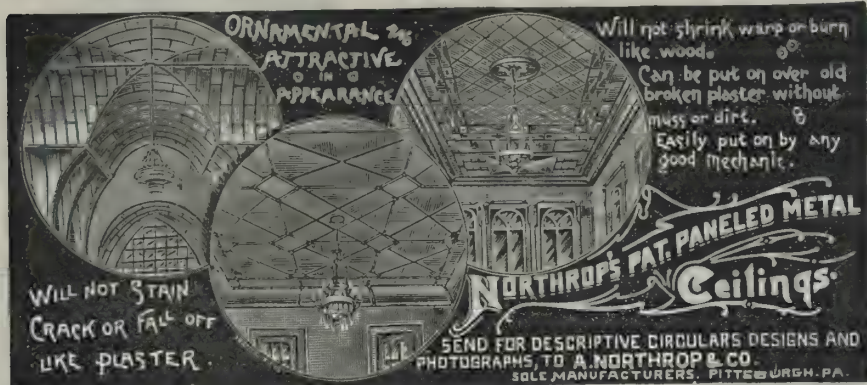
ART STAINED GLASS

FOR CHURCHES, DWELLINGS, Etc.

Keystone Stained Glass Works,  
271 SOUTH 5th ST., PHILADELPHIA.

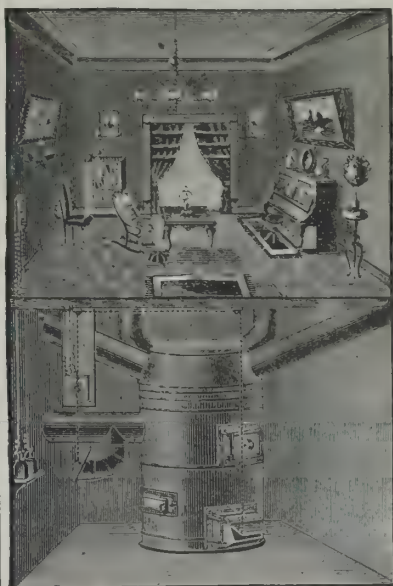


YOUR : CEILING : IS : CRACKED : AND : BROKEN.  
LOOK AT SOMETHING NEW, NEAT, AND DURABLE.



Church. School. Hall. Theater. Store. Parlor. Library. Kitchen.

Far surpassing either plaster or wood ceilings. Send size and diagrams of rooms and get special designs. These ceilings are covered by Six original Patents.  
**A. NORTHROP & CO., SOLE MANUFACTURERS, PITTSBURGH, PA.**  
NEW YORK AGENCY: JOHN McALLUM, Cor. Washington & Vestry Streets.



Showing application of Regulator to Hot Air Furnace.  
Local Companies: A. M. BUTZ & CO., 154 Lake St., Chicago, Ill.

## AUTOMATIC REGULATORS

FOR  
Steam Heaters, Hot Water Heaters,  
Hot Air Furnaces,

And all other kinds of Heating Apparatus.

Perfect Control of Temperature in Private Residences, Public Buildings, School Houses, Churches, Railway Cars, Green Houses, etc.

The Automatic Electric Heat Regulator controls the Furnace or Heater by the temperature of the living rooms of the house. If the temperature of the room rises above the desired degree the Regulator instantly closes the drafts of the Furnace and opens a check-damper in the smoke-pipe. If the temperature drops below the desired degree, the Regulator instantly closes the check-damper and opens the drafts of the Furnace. The Regulator can be set for any desired temperature, and thus the house can be kept at a lower temperature at night, or the same uniform temperature may be maintained day and night. Can be applied to any kind of heating apparatus.

We wish to establish a local company in each State, to whom exclusive privileges under all our patents will be guaranteed. This company controls all the patents of Bradford, Butz, Sternberg, Draper and Thompson. These are foundation patents and cover broadly Automatic Electric Heat Regulators. Do not buy, sell or use any infringing Apparatus. Write for Illustrated Catalogue.

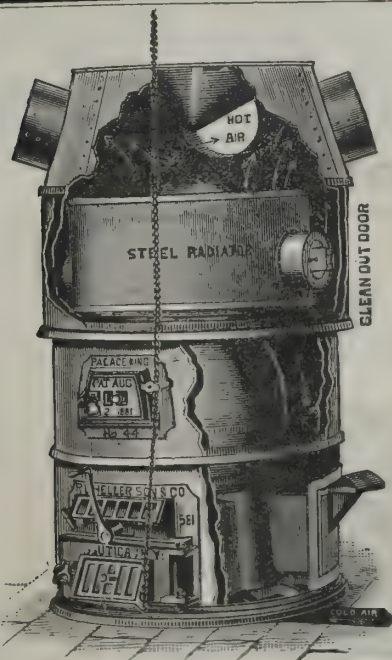
**Consolidated Temperature Controlling Co.**  
809 HENNEPIN AVENUE.  
**MINNEAPOLIS, MINNESOTA.**

N. E. HEAT REGULATOR CO., 61 Bromfield St., Boston, Mass.

## Classified Index of Advertisements Published in the Present Number of the Scientific American, Architects and Builders Edition.

Change of copy for advertisements should reach us not later than 15th of month to appear in issue following.

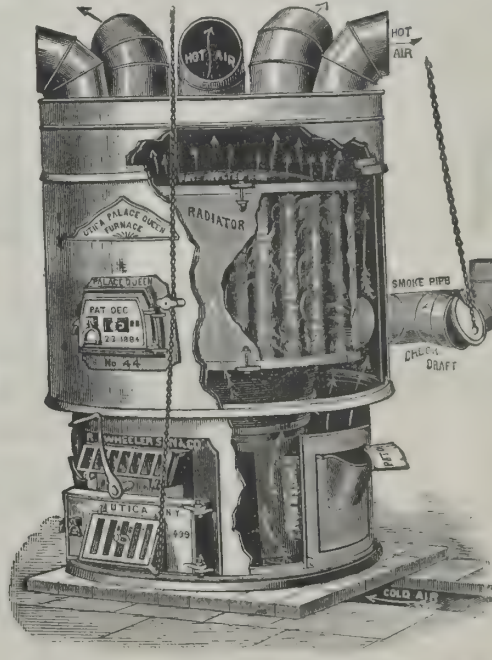
<b>Adjustable Planes.</b> Stanley Rule & Level Co. .... cover ii	<b>Brass Work for Church Altars.</b> Joseph Neumann Co. (Ltd.)... cover iii	<b>Cupola Furnaces, etc.</b> The Hartsfeld Furnace and Refining Co. .... xi	<b>Foot and Hand Power Machinery.</b> W. F. & J. Barnes Co. .... ii C. E. Little ..... ii J. M. Marston & Co. .... xii Fred. A. Rich ..... vi Sebastian May & Co. .... ii Seneca Falls Mfg. Co. .... ii John Wilkinson Co. .... xi
<b>Advertising Glass Signs.</b> The Western Sand Blast Co. .... ix	<b>Brick.</b> Chicago Anderson Pressed Brick Co. .... xi Peerless Brick Co. .... v	<b>Cutter Heads.</b> Sam'l J. Shimer & Sons ..... iv	<b>Furnaces.</b> Abram Cox Stove Co. .... cover iii Boynton Furnace Co. .... viii Alsop Furnace and Stove Co. .... x H. Gilbert Hart & Co. .... x Howard Furnace Co. .... cover ii E. A. Jackson & Bro. .... cover ii Leibbrandt & McDowell Stove Co. .... i J. F. Pease Furnace Co. .... i J. Reynolds & Son ..... x Richardson & Boynton Co. .... viii R. Wheeler, Son & Co. .... xiii
<b>Annunciators.</b> Partrick & Carter ..... vii	<b>Brick Machinery.</b> Henry Martin ..... v	<b>Decorative Lattice.</b> Cutting & De Laney ..... xii C. S. Ransom & Co. .... ix	<b>Gang Lath Mill.</b> S. Adams & Sons ..... ii
<b>Architects' and Surveyors' Supplies.</b> L. Manasse ..... iv	<b>Builders' Hardware.</b> C. A. Strelinger & Co. .... iii	<b>Door Knobs.</b> Dibble Mfg. Co. .... v	<b>Gas and Water Pipes.</b> Mellert Foundry & Machine Co. .... cover iii Penna. Pipe Mfg. Co. .... cover iv
<b>Architects.</b> Munn & Co. .... vi	<b>Builders' Scroll Saw.</b> W. F. & J. Barnes Co. .... ii	<b>Doors, Sash and Blinds.</b> Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Gas Engines.</b> Economic Gas Engine Co. .... cover ii Williams & Orton Mfg. Co. .... cover ii
<b>Architectural Wood Turning.</b> Anderson & Dickey ..... iv Standard Wood Turning Co. .... iv	<b>Building Paper, Felt, Etc.</b> M. Ehret, Jr. & Co. .... cover iv Warren-Ehret Co. .... cover vii H. F. Watson ..... cover iii	<b>Door Hangers.</b> Lane Bros ..... iv	<b>Gas Fires.</b> H. P. Dixon & Co. .... cover iv
<b>Art Metal Work.</b> The Joseph Neumann Co. (Ltd.)... cover iii	<b>Cabinet Woods and Veneers.</b> J. Rayner ..... i	<b>Drilling Tools and Machinery.</b> C. H. Besly & Co. .... ii	<b>Gas Machines.</b> Gilbert & Barker Mfg. Co. .... vi Tirrill Gas Machine Co. .... xi
<b>Artistic Wood Decorations.</b> Buffalo Novelty Wood Turning Co. .... xii Cutting & De Laney ..... xii Mankey Decorative Co. .... xii E. P. Wilce & Co. .... xii	<b>Cables.</b> Standard Underground Cable Co. .... i	<b>Dumb Waiter Fixtures.</b> The Edward Storm Spring Co. .... vii M. B. Swezey ..... ii	<b>Glass-Plate and Cylinder Window.</b> Cohansey Glass Mfg. Co. .... cover iii Hires & Co. .... cover i Malaga Glass & Mfg. Co. .... cover iv Pittsburg Plate Glass Co. .... i P. Semmer Glass Co. .... vi Vanhorne, Griffen & Co. .... vi
<b>Artists' Materials.</b> A. H. Abbott & Co. .... cover iii F. W. Devoe & Co. .... i	<b>Carbolate of Lime.</b> M. Ehret, Jr. & Co. .... cover 17	<b>Eaves Trough and Gutters.</b> Hatten, Galpin & Co. .... ix	<b>Glass-Stained and Mosaic.</b> Beacon Stained Glass Works. .... cover ii Alfred Godwin. .... cover iv Hires & Co. .... cover ii Keystone Stained Glass Works. .... xii C. H. Postel & Co. .... cover iii William Reith. .... cover ii F. J. Riester. .... cover ii Tiffany Glass Co. .... vi
<b>Asphalt Paint and Cement.</b> M. Ehret, Jr. & Co. .... cover iv Warren Chemical and Mfg. Co. .... vii	<b>Carpenters' Machinery.</b> Fred. A. Rich ..... i	<b>Electric Conductors and Cables.</b> Standard Underground Cable Co. .... i	<b>Greenhouse Boilers.</b> Hitchings & Co. .... cover ii New York Central Iron Works. .... cover iii
<b>Asbestos.</b> H. W. Johns Mfg. Co. .... ix H. F. Watson ..... cover iii	<b>Carpenters' Tools.</b> Standard Tool Co. .... vii Stanley Rule and Level Co. .... cover ii Strelinger, C. A. & Co. .... iii John Wilkinson Co. .... xi	<b>Electric Lights.</b> The Thomson-Houston International Electric Co. .... cover iii	<b>Ground &amp; Rough Glass for Floors, Etc.</b> Pittsburg Plate Glass Co. .... ix
<b>Auger Bit Files.</b> C. A. Strelinger & Co. .... iii	<b>Carpet Lining.</b> Warren-Ehret Co. .... cover iii H. F. Watson ..... cover iii	<b>Electrical Supplies.</b> Partrick & Carter ..... vii Shaw & Geary ..... cover iv	<b>Gymnastic Apparatus.</b> Narragansett Machine Co. .... xiv
<b>Automatic Heat Regulator.</b> The Guion Automatic Heat Regulating Co. viii	<b>Cements.</b> H. W. Johns Mfg. Co. .... ix M. Ehret, Jr. & Co. .... cover iv	<b>Elevators.</b> L. S. Graves & Son ..... v J. L. Haven & Co. .... cover iii Henry H. Hill ..... ii Howard Iron Works ..... v Morse, Williams & Co. .... ii	<b>Gypsum Paint.</b> John Maxwell ..... iv
<b>Balusters, Stair Rails, Etc.</b> The Standard Wood Turning Co. .... iv Anderson & Dickey ..... iv	<b>Combination Dividers.</b> Standard Tool Co. .... vii L. S. Starrett ..... vii	<b>Eliminator.</b> Hine & Robertson ..... vii	<b>Hand Sawing Machines.</b> W. F. & J. Barnes Co. .... ii
<b>Bath Tubs (Tile-lined).</b> Sharpless & Watts ..... iv	<b>Contractor and Builder.</b> Allen B. Rorke ..... cover iii	<b>Engineers' Supplies.</b> L. Manasse ..... iv	
<b>Bent and Beveled Glass.</b> Vanhorne, Griffen & Co. .... i	<b>Cordage.</b> Samson Cordage Works ..... cover ii	<b>Feed Water Heaters.</b> Stewart Heater Co. .... cover ii	
<b>Birge Velours.</b> M. H. Birge & Sons ..... xi	<b>Corrugated Iron for Roofing, Siding and Ceiling.</b> The Cincinnati Corrugating Co. .... ii W. G. Hyndman & Co. .... ii A. Northrop & Co. .... xiii Thompson Mfg. Co. .... ii	<b>Fire Apparatus.</b> Rumsey & Co. .... iii	
<b>Black Varnish.</b> M. Ehret, Jr. & Co. .... cover iv	<b>Covering for Steam, Gas, and Water Pipes.</b> M. Ehret, Jr. & Co. .... cover iv H. W. Johns Mfg. Co. .... ix Shields & Brown ..... ii Western Mineral Wool Co. .... v	<b>Fire Brick.</b> Henry Maurer & Son ..... ii	
<b>Boiler Coverings.</b> M. Ehret, Jr. & Co. .... cover iv Shields & Brown ..... ix H. W. Johns Mfg. Co. .... ix	<b>Creosote Wood Stains for Shingles, Etc.</b> Samuel Cabot ..... xiv	<b>Fireproof Building Materials.</b> Henry Maurer & Son ..... ii	
<b>Booksellers and Publishers.</b> American Garden ..... ix Houghton, Mifflin & Co. .... vi J. B. Lippincott & Co. .... vi Ticknor & Co. .... vi John Wiley & Sons ..... vi		<b>Fireproof Ceiling or Siding Plates.</b> Cortright Metal Roofing Co. .... xi Thompson Mfg. Co. .... ii	
<b>Brass Goods.</b> C. H. Besly & Co. .... ii		<b>Fireproofing Material.</b> H. W. Johns Mfg. Co. .... ix H. F. Watson ..... cover iii	



# PALACE KING —AND— PALACE QUEEN WARM AIR FURNACES.

SEND FOR CATALOGUE.

**RUSSEL WHEELER, SON & COMPANY,**  
**UTICA, N. Y.**



## CHILTON PAINTS.

The Chilton Manuf. Co. would call the attention of Architects and persons desiring a good article to their Pure Linseed Oil Paints. The most durable and therefore the most economical in use. Sample cards of colors sent on application.

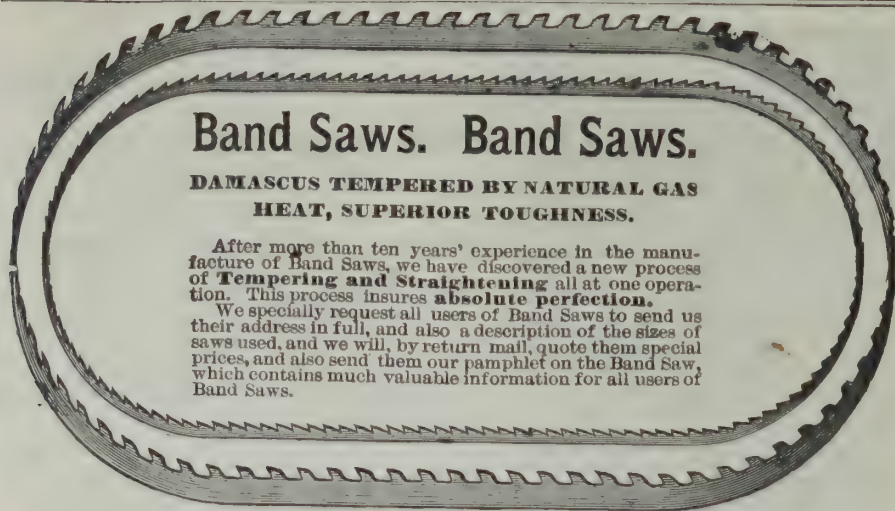
147 Fulton St., New York  
141 Milk Street, Boston.



### Band Saws. Band Saws.

**DAMASCUS TEMPERED BY NATURAL GAS HEAT, SUPERIOR TOUGHNESS.**

After more than ten years' experience in the manufacture of Band Saws, we have discovered a new process of **Tempering and Straightening** all at one operation. This process insures **absolute perfection**. We specially request all users of Band Saws to send us their address in full, and also a description of the sizes of saws used, and we will, by return mail, quote them special prices, and also send them our pamphlet on the Band Saw, which contains much valuable information for all users of Band Saws.



The Superior Quality of our Band Saws, All Tempered, Straightened, and Tried at one operation, which we have patented, makes them so perfect that our **SALES HAVE MORE THAN TREBLED IN THE PAST YEAR**. Our largest and best customers prefer them to the best imported saws.

**WRITE FOR OUR CIRCULAR AND REDUCED PRICE LISTS.**

### NATURAL GAS

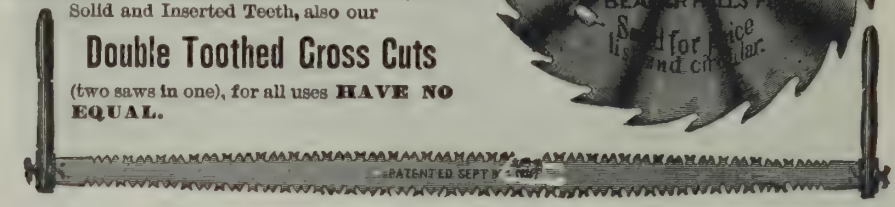
Is perfectly free from all impurities, and steel heated by its use does not scale. It contains no sulphur or other base substances. We are the first to adopt its use in heating saws for tempering, which explains the cause of our saws being tougher than any others now made.

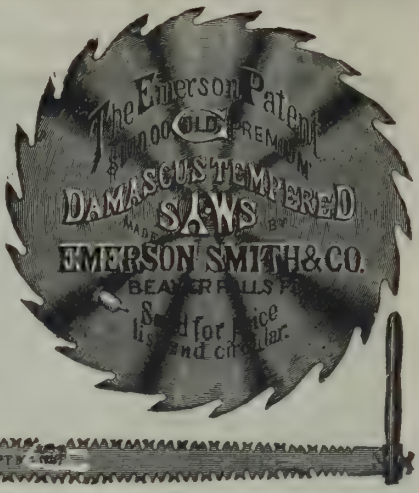
### OUR CIRCULAR SAW

Of all sizes from 8 inches in diameter to 6 feet, both Solid and Inserted Teeth, also our

#### Double Toothed Cross Cuts

(two saws in one), for all uses **HAVE NO EQUAL.**





Our **SAWYER'S HANDBOOK** will be sent **FREE** to any part of the world on receipt of full name and address.

Address **EMERSON, SMITH & CO. (LIMITED),**  
**Beaver Falls, Pa.**

CLASSIFIED ADVERTISEMENTS.—Continued from page xiii.

<b>Heating Apparatus</b> Abram Cox Stove Co. .... cover iii Aldine Mfg. Co. .... x Alsop Furnace and Stove Co. .... x Barstow Stove Co. .... viii B. C. Bibb Stove Co. .... x Boynton Furnace Co. .... viii Broomell & Sanks. .... x Danforth & Clark. .... ix Duplex Steam Heater Co. .... cover ii E. N. Gates. .... x Gurney Hot-Water Heater Co. .... iii H. Gilbert, Hart & Co. .... ix Howard Furnace Co. .... cover ii Hitchings & Co. .... cover ii E. A. Jackson & Bro. .... cover ii Leibrandt & McDowell Stove Co. .... i National Hot Water Heater Co. .... viii New York Central Iron Works. .... cover iii J. F. Pease Furnace Co. .... i Pierce, Butler & Pierce. .... cover ix J. Reynolds & Son. .... x Richardson & Boynton Co. .... viii The H. B. Smith Co. .... x B. F. Sturtevant. .... viii Weston Engine Co. .... cover iv R. Wheeler, Son & Co. .... xiii Woodcock & Co. .... viii	<b>House Filters.</b> Hyatt Pure Water Co. .... xi	<b>Ice and Refrigerating Machines.</b> Pictet Artificial Ice Co. .... v	<b>Iron and Metal Workers' Tools.</b> C. A. Strelinger & Co. .... iii	<b>Iron Work for Building Purposes.</b> Composite Iron Works. .... cover ii Mellert Foundry & Machine Co. .... cover iii	<b>Japanese Fret Work.</b> Buffalo Novelty Wood Turning Co. .... xii	<b>Leveling Instruments.</b> John W. Harmon. .... ii C. F. Richardson. .... iv	<b>Lithographers.</b> Schumacher & Ettlinger. .... cover ii	<b>Mahogany.</b> J. Rayner. .... xi	<b>Mantels, Grates, Fire Places, Etc.</b> E. J. Johnson. .... vi	<b>Masons' and Builders' Supplies.</b> S. H. French & Co. .... iii	<b>Mathematical Instruments.</b> F. W. Devoe & Co. .... i	<b>Metal Signs.</b> Joseph Neumann Co. (Ltd.). .... cover iii	<b>Metallic Roofing Tiles and Shingles.</b> Cortright Metal Roofing Co. .... xi Gummey, Sperring & Co. .... cover iv Metallic Hip Shingle Co. .... iv National Sheet Metal Roofing Co. .... xi	<b>Mineral Wool.</b> U. S. Mineral Wool Co. .... v Western Mineral Wool Co. .... v	<b>Moorish Fret Work.</b> C. S. Ransom & Co. .... ix	<b>Mortar Colors.</b> S. H. French & Co. .... iii	<b>Office and Bank Fittings</b> A. H. Andrews & Co. .... iii	<b>Oil Well Supplies.</b> Oil Well Supply Co. .... iii	<b>Ornamental Brick.</b> Chicago Anderson Pressed Brick Co. .... xi Peerless Brick Co. .... v	<b>Ornamental Glass Work.</b> C. H. Postel & Co. .... cover iv The Western Sand Blast Co. .... ix	<b>Ornamental Rustic Work.</b> John Wheeler. .... iv	<b>Paints.</b> The Chilton Mfg. Co. .... xiii F. W. Devoe & Co. .... i S. H. French & Co. .... iii H. W. Johns Mfg. Co. .... ix The Standard Paint Co. .... cover iv	<b>Paper Hangings.</b> M. H. Birge & Sons. .... xi	<b>Parchment Sheathing.</b> Hallett Bros. .... xii	<b>Parquet Floors.</b> J. Dunfee & Co. .... x	<b>Patents.</b> Munn & Co. .... xi	<b>Pattern Makers' and Carvers' Tools.</b> C. A. Strelinger & Co. .... iii	<b>Photographic Outfits.</b> E. & H. T. Anthony & Co. .... ii	<b>Planing Mill Machinery.</b> Hoyt & Bro. Mfg. Co. .... xii	<b>Polished Plate Glass.</b> Pittsburgh Plate Glass Co. .... ix P. Semmer Glass Co. .... vii Vanhorne, Griffen & Co. .... i	<b>Porous Terra Cotta.</b> Henry Maurer & Son. .... ii	<b>Porous Earthenware.</b> Henry Maurer & Son. .... ii	<b>Portland Cement.</b> Lesley & Trinkle. .... cover iv	<b>Poultry Yard Appliances.</b> S. S. Bent & Son. .... iv	<b>Prepared Roofing.</b> M. Ehret, Jr., & Co. .... cover iv H. F. Watson. .... cover iii	<b>Pressed Brick.</b> Chicago Anderson Pressed Brick Co. .... xi	<b>Pumping Engines.</b> Economic Gas Engine Co. .... cover ii	<b>Pumps for all Purposes.</b> Rumsey & Co. .... iii	<b>Recording Thermometer.</b> The Draper Mfg. Co. .... iv	<b>Roof Snow Guards.</b> John H. Hiller. .... cover ii	<b>Roofing Paper, Etc.</b> M. Ehret, Jr., & Co. .... cover iv H. W. Johns Mfg. Co. .... x The Standard Paint Co. .... cover iv Warren-Ehret Co. .... cover iii Warren Chemical & Mfg. Co. .... vii H. F. Watson. .... cover iii	<b>Roofing Slate.</b> E. J. Johnson. .... vi The Old Bangor Slate Co. .... vi	<b>Roofing Tin.</b> Gummey, Sperring & Co. .... cover iv N. & G. Taylor Co. .... cover iv	<b>Roofing and Wall Tiles.</b> Cortright Metal Roofing Co. .... xi The National Sheet-Metal Roofing Co. .... xi The Standard Paint Co. .... cover iv	<b>Rustless Iron Water Pipe.</b> The Wells Rustless Iron Co. .... v	<b>Sand Blast and Embossed Railroad Glass.</b> The Western Sand Blast Co. .... ix	<b>Sash Cord.</b> Samson Cordage Works. .... cover ii J. P. Tolman & Co. .... cover ii	<b>Sash Lock.</b> Jenkins & Timby. .... iii	<b>Saws.</b> American Saw Co. .... cover iii Emerson, Smith & Co. .... xiv Seneca Falls Mfg. Co. .... ii	<b>Scroll Saws and Tools.</b> W. F. & J. Barnes Co. .... ii Seneca Falls Mfg. Co. .... ii	<b>Sewer Gas and Back Water Trap.</b> F. E. Cudell. .... ii	<b>Shade Roller.</b> Cushman Bros. & Co. .... ii	<b>Shaking Grate.</b> Woodcock & Co. .... viii	<b>Sheathing Lath.</b> I. G. Jenkins. .... iii	<b>Shingle Stains.</b> Sam'l Cabot. .... xiv Dexter Bros. .... i	<b>Shutter Worker.</b> F. B. Mallory. .... iii	<b>Skylights.</b> G. Hayes. .... iv	<b>Slate Roofers' Supplies.</b> E. J. Johnson. .... vi	<b>Sliding Blinds.</b> Hartman & Durstine. .... x Wm. Willer. .... x	<b>Stable Fittings and Fixtures.</b> S. S. Bent & Son. .... iv	<b>Steam Hot Blast Apparatus.</b> B. F. Sturtevant. ....	<b>Steam &amp; Hot Water Heating Engineers.</b> Danforth & Clark. .... cover iii	<b>Tools and Machinery for Oil Wells.</b> Oil Well Supply Co. .... iii	<b>Tools and Foot Power Machinery.</b> C. E. Little. .... ii Seneca Falls Mfg. Co. .... ii	<b>Tower Ornaments, Finials, Etc.</b> Thos. W. Jones. .... vi	<b>Underground Cable.</b> Standard Underground Cable Co. .... i	<b>Valves and Fire Hydrants.</b> Mason Regulator Co. .... iv Mellert Foundry & Machine Co. .... cover iii	<b>Varnish.</b> F. W. Devoe & Co. .... i Standard Varnish Works. .... v	<b>Ventilating and Exhaust Fans.</b> Geo. P. Clark. .... v The Simonds Mfg. Co. .... cover ii	<b>Wall Plaster.</b> Adamant Mfg. Co. .... vii	<b>Water Heaters.</b> Instantaneous Water Heater Co. .... iv	<b>Waterproof Parchment.</b> Hallett Bros. .... xii	<b>Weather Strips.</b> J. Dunfee & Co. .... x Richmond Weather Strip Co. .... v	<b>Weather Vanes.</b> Thos. W. Jones. .... vi	<b>Well Tools.</b> American Well Works. .... ii	<b>Window Guards and Gates.</b> Composite Iron Works. .... cover ii	<b>Window Sash Cord.</b> Samson Cordage Works. .... cover ii	<b>Wood Carpet.</b> J. Dunfee & Co. .... x	<b>Wood Finishes.</b> Bridgeport Wood Finishing Co. .... viii F. W. Devoe & Co. .... i Murphy & Co. .... i D. Rosenberg & Sons. .... ix	<b>Wood Floors.</b> Boughton & Terwilliger. .... ix	<b>Wood Mantels.</b> Mankey Decorative Co. .... xii	<b>Woodworking Machinery.</b> J. O. Colladay & Co. .... xii Connell & Dengler. .... xii The Egan Co. .... xii E. & F. Gleason. .... cover iv Hoyt & Brother Co. .... xii C. B. Rogers & Co. .... iv Samuel J. Shimer & Sons. .... iv	<b>Wrought Iron and Cement Lined Pipe.</b> Penna. Pipe Mfg. Co. .... cover iv
--	---	--	--	--	---	--	--	--	---	---	--	--	--	--	---	--	---	---	---	---	---	---	---	---	--	---------------------------------------	---	--	---	--	---	---	--	--	--	---	--	---	--	---	---	---	---	---	--	--	--	--	---	---	--	---	---	---	--	---	--	---	--	---	---	---	---	--	--	--	---	---	---	---	---	--	---	--	--	--	---	---	---	--	--	---	--

# A VALUABLE BOOK

## ON PHYSICAL CULTURE

# FREE


## ON APPLICATION.

ILLUSTRATED BY 31 ARTISTIC ENGRAVINGS, DRAWN FROM NATURE BY A CELEBRATED ARTIST.

**NARRAGANSETT MACHINE CO.,**  
**55 Sprague Street, Providence, R. I.**

HOUSE AT CHESTNUT HILL, PHILADELPHIA, PA., STAINED WITH

## CABOT'S CREOSOTE STAINS.



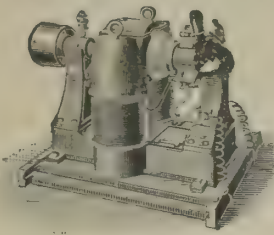
These stains have been in use for the past seven years, and have proved themselves in every way the most satisfactory coloring for shingles. They are durable and artistic. Prices are 30c., 50c., and 75c. per gallon, according to color. Our stains contain NO WATER and are the only exterior stains not adulterated with KEROSENE. Send for Samples on Wood, and Circulars.

**SAM'L CABOT, Sole Manufacturer, 70 KILBY STREET, BOSTON.**



# The Thomson-Houston Electric Motor.

ECONOMICAL,  
RELIABLE,  
DURABLE.

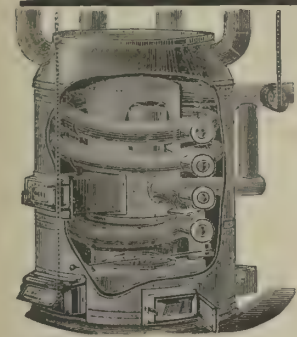


NO HEAT,  
NO DIRT,  
NO DANGER.

MOTOR

The Thomson-Houston Electric Motor is used for Machine Shops, Printing Offices, Carpenter Shops, Ventilating Machinery. Especially adapted to Elevators. For estimates address

THOMSON-HOUSTON INTERNATIONAL ELECTRIC CO.,  
620 ATLANTIC AVENUE, BOSTON, MASS.



THE  
Wrought-Steel or Cast-Iron Spiral Radiator and  
Portable Dome Furnaces,

MANUFACTURED BY

THE M. H. JACOBS FURNACE CO.,  
SYRACUSE. NEW YORK.

For Warming City or Country Residences, Hotels, Stores, Churches  
and Public Buildings.

THESE FURNACES HAVE NO EQUAL.

Contractor & Builder.

ALLEN B. RORKE,  
423 Walnut St.,  
PHILADELPHIA.

A.H. ABBOTT & CO.  
50 MADISON ST. CHICAGO.  
TRAVERS CLOTH.  
MATH INSTRUMENTS.  
SURVEYING INSTRUMENTS.  
ARTISTS' MATERIALS.

35 YEARS EXPERIENCE  
STEAM HYDRAULIC ELEVATORS SAFETY SPEED  
HAND POWER DUMB WAITERS SERVICE  
THE JAS. L. HAVEN COMPANY.  
CINCINNATI, O. U.S.A.

# AMERICAN SAW CO.

Trenton, N. J. MANUFACTURERS OF  
Patent TOOTH and SOLID  
SAWS, GANGS, CROSS  
CUTS, MULAY, MILL, &c  
"ALLIGATOR WRENCHES."

# SAWS

## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

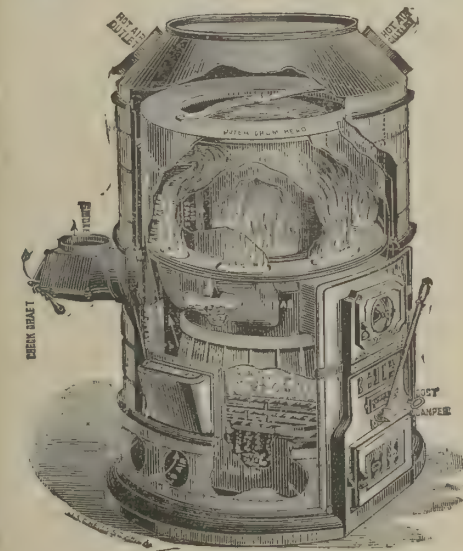
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



SOMETHING NEW!

Model Novelty Range.

Economy in Space, Fuel, and Labor.  
No Brick Jambs or Lintel or Boiler Stand.  
Horizontal Hot Water Boiler on  
Top of Range.  
HOT AIR ATTACHMENT.  
MANY OTHER FEATURES.

Architects, Builders, and Owners should see and  
call for the above Specialties for Dwellings or  
Apartment Houses.

ABRAM COX STOVE CO.,  
PHILADELPHIA and CHICAGO,  
EXPERTS AND SPECIALISTS IN HOT AIR AND  
RANGE SUPPLIES.

NEW YORK AGENCY:  
WILKINSON & BANTA,  
250 WATERSTREET.



# ART STAINED GLASS

For Churches & Dwellings  
Antique and Mosaic Work.  
Designs and Estimates on application.  
William Reith,  
134 N. 7th St., Philadelphia, Pa.

WORKS ESTABLISHED AT READING, PA. 1845  
MANUFACTURERS OF  
WATER & GAS PIPES

Cast Iron Pipe for Structural Work, Columns, etc.  
Flange Pipe and Specials.  
STOP VALVES, FIRE HYDRANTS, LAMP POSTS.  
MELLERT FOUNDRY & MACHINE CO., Limited,  
READING, PA.

# Art \* Metal Work

The JOSEPH NEUMANN CO., Limited, N. W. Cor. Eleventh & Race Sts., PHILADELPHIA, PA.

BRASS LAMPS FOR CHURCHES.  
BRASS WORK FOR CHURCH ALTARS.  
BRONZE GRILLES FOR DOORS.  
WINDOW RAILINGS.  
ORNAMENTAL LANTERNS.  
BRASS RAILINGS FOR BANKS.  
METAL SIGNS.

# STAINED GLASS

MEMORIAL, CHURCH,  
AND  
DOMESTIC WORK.

C. H. POSTEL & CO.,

Branch Office, 527 Arch Street.

1314 RIDGE AVE. PHILADELPHIA.

# STEAM and HOT WATER HEATING ENGINEERS

Correspondence Solicited.

Danforth & Clark, Buffalo, N. Y.

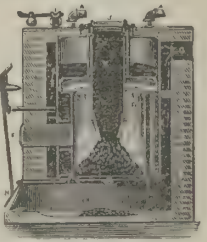
BUFFALO  
STAINED GLASS  
WORKS

Manufacturer of Ecclesiastic and Domestic  
ART STAINED GLASS,  
F. J. RIESTER, Prop'r, Buffalo, N. Y.

The Dunning Patent Wrought Iron Boiler. (Over 13 500 in use.)



THE Dunning Boiler, Self-Feeding, is the best for Low Pressure Steam Heating, and insures a warm house night and day. Free from Carbonic Acid Gas and Smoke. Made in eleven sizes, suitable to heat the smallest Cottage to the Largest Business Block, in five different styles:  
As a Magazine Boiler, which requires attention but once in twenty-four hours.  
As a Surface Burning Boiler, which will burn Hard or Soft Coal, Wood, Coke or Gas.  
As a Hot Water Boiler, for Green Houses and hot water heating.  
As a Portable Boiler, to be set without brickwork.  
Also in Two Sections, to pass through any door or window, where whole one cannot enter. Steam Engines and Boilers of all kinds and machinery generally. Manufactured at the New York Central Iron Works, Geneva, N. Y., U.S.A.  
LOCK BOX 40. Send for New Illustrated Catalogue.



Trade Mark.

"Cohansey" & "Bridgeton" BRANDS,

Superior Packing and Sorting.

Believed equal to MOST IMPORTED and superior to other American, for Builders, Sash Manufacturers, Painters, and Florists.

# WINDOW GLASS.

COHANSEY GLASS MFG. CO., 32 North Fourth St., PHILADELPHIA, PA.

## Novelty Furnaces and Ranges

Novelty Hot Air Furnace.

BEST IN USE.

Tens of thousands in use.

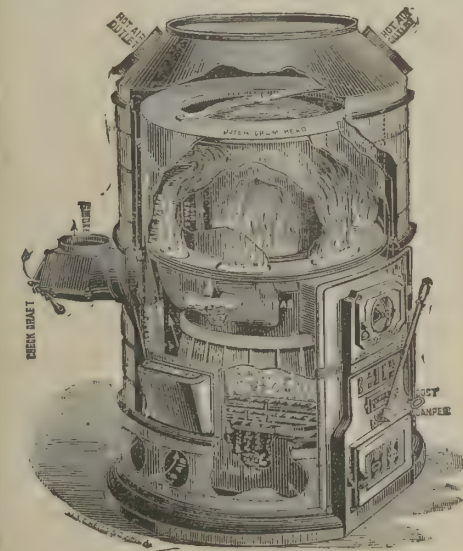
Thirteen years of service.

Universally satisfactory.

Original and only Steel Plate

Three Drum Construction.

EIGHTEEN SIZES & STYLES.



SOMETHING NEW!

Model Novelty Range.

Economy in Space, Fuel, and Labor.  
No Brick Jambs or Lintel or Boiler Stand.  
Horizontal Hot Water Boiler on  
Top of Range.  
HOT AIR ATTACHMENT.  
MANY OTHER FEATURES.

Architects, Builders, and Owners should see and  
call for the above Specialties for Dwellings or  
Apartment Houses.

ABRAM COX STOVE CO.,  
PHILADELPHIA and CHICAGO,  
EXPERTS AND SPECIALISTS IN HOT AIR AND  
RANGE SUPPLIES.

NEW YORK AGENCY:  
WILKINSON & BANTA,  
250 WATERSTREET.

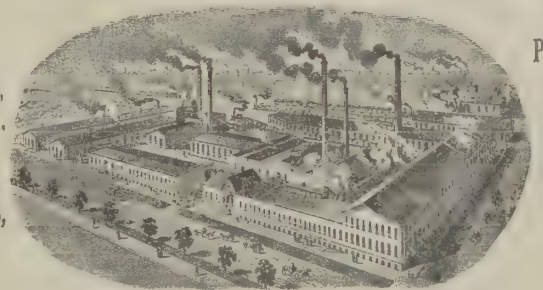


# KEYSTONE PREPARED ROOFING

BEST QUALITY. EASILY APPLIED.

BUILDING PAPERS.

ROSIN SIZED and  
WATERPROOF  
SHEATHINGS,  
DEADENING FELTS,  
PLAIN and  
CORRUGATED  
CARPET LININGS,  
ASBESTOS  
SHEATHINGS, Etc.



2 and 3 PLY  
PREPARED ROOFING,  
TARRED ROOFING  
FELTS,  
ROOFING  
MATERIALS,  
Etc., Etc.  
Send for Samples  
and Prices.

ERIE PAPER MILLS. CAPACITY, 60 TONS PER DAY.

H. F. WATSON, MFR., ERIE, PA.

CHICAGO, ILL.,  
Office, 86 Washington St.

NASHVILLE ROOFING & PAVING CO.,  
Nashville, Tenn.

LIBBY & WILLIAMS PAPER CO.,  
St. Louis, Mo.

# Warren-Ehret Co.,

—MANUFACTURERS OF—

# ROOFING

OF ALL KINDS.

BUILDING & SHEATHING PAPERS,

Also all kinds of Concrete Cement Work Pavements, Cellar and Stable Floors, etc.  
Broken Slag for Roadways, Concreting, Railroad Ballast, etc.

OFFICE, 428 MARKET ST., PHILADELPHIA.

—WORKS:—

13th and Cumberland Sts., Phila., and Spring Mill, Montgomery Co., Pa.

ESTIMATES MADE AND SAMPLES FURNISHED ON APPLICATION.



## The BEST Roofing Tin is the CHEAPEST!

But how are you to know that you  
get the quality and brand wanted?

Because every PERFECT SHEET of the  
following three extra fine guaranteed  
brands of Roofing TIN IS STAMPED at  
the works with the name of the brand and  
the thickness. Please note this.

"Old Style." Extra Heavily Coated.  
The Best Made.  
"Westminster." Re-dipped. Made  
from Heavy Iron.

COCKLEY K Highest Grade of  
Heavy Regular Coated.  
EVERY BOX IS GUARANTEED.

Sample pieces of the Tin, also circulars and  
full information given.

**N. & G. TAYLOR CO.**  
Established 1810. 79th year.  
**PHILADELPHIA.**

# Prepared Roofing

BEST, CHEAPEST, MOST DURABLE.



**PHILADELPHIA,**  
423 Walnut Street.

**ST. LOUIS,**  
113 North 8th Street.

**CHICAGO,**  
50 Dearborn Street.

ANYBODY CAN PUT IT ON.  
EASILY HANDLED.

PUT UP IN ROLLS OF 100 SQUARE FEET.

Send for Latest Circular, Price List, etc.

MANUFACTURED BY  
**M. EHRET, Jr., & CO.,**

## THE "FLORIDA" HEATERS

FOR STEAM HEATING.

16 Sizes—Magazine Feed for Hard Coal or Coke.  
16 Sizes—Surface Feed for Soft Coal, Wood or Gas.

For Hot Water Heating.

15 Sizes—Magazine or Surface Feed. Adapted to  
any fuel.

IN WARMING

**Suburban Homes**

The "Florida" has an established reputation. Its  
use insures uniform temperatures day and night.  
They are first-class in every respect, reliable, dur-  
able, and give best results in economical use of  
fuel, many thousands being in use. Descriptive  
book and references mailed free.

Address the Sole Manufacturers,

**Pierce, Butler & Pierce Mfg. Co.,**  
**SYRACUSE, N. Y.**

Estimates free. Satisfactory results guaranteed.

## To "ARCHITECTS," "ROOFERS," AND THOSE THAT WANT FIRST- CLASS ROOF SPECIFY AND BUY THE OLD STANDARD BRANDS

"Alderly." "Pennsyl" Old Method. "Alderly." "Pennsyl" Old Method.  
"Alderly." "Pennsyl" Old Method. "Alderly." "Pennsyl" Old Method.

The TWO BEST BRANDS GUARANTEED PLATES. NO BETTER MADE. HEAVIEST COATED. This has been proved by actual test.

The 14x20 size contains 14 lbs. per Box Coating; the 28x20 contains 28 lbs. Coating.

Send for sample boxes. If not satisfactory, can be returned, our expense. PATTEN METALLIC SHINGLES, best Shingle in the market.

**GUMMEY, SPERING & CO., PHILADELPHIA.**



### YOUR ATTENTION

IS ESPECIALLY DIRECTED TO THE

Advertisement (on Page i of Advertising)

—OF THE—

**Celebrated Economy Heaters,**

**J. F. PEASE FURNACE CO.,**

Syracuse, N. Y., U. S. A., and Toronto, Ont., Canada.

## The Standard Paint Co.

59 MAIDEN LANE, NEW YORK,

SOLE MANUFACTURERS OF THE

**Celebrated P & B Products,**

**IDEAL ROOFING,**  
**SHEATHING and INSULATING PAPERS.**  
**Electrical Compound. Tanners', Brewers',**  
**and Preservative Paints.**



Please mention this paper

## WROUGHT IRON AND CEMENT LINED PIPE.

This pipe is especially adapted for Water, Gas, and Sanitary purposes.

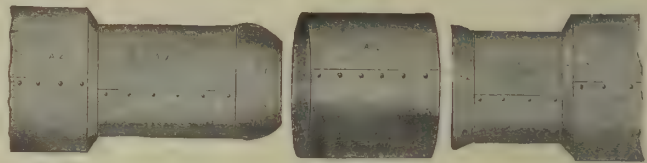
The construction of the pipe giving it STRENGTH, DURABILITY, and PURITY, and is impervious. Will not ENCRUST or CORRODE.



Pipe complete and ready for the trench.

It is designed for  
Public Works,  
Public Buildings,

—AND—  
Private Dwellings.



Wrought iron sleeve and the male and female ends before connecting for jointing.  
MANUFACTURED BY THE  
**PENNSYLVANIA PIPE MANUFACTURING CO.,**  
Germantown Junction, Philadelphia, Pa.

## STAINED GLASS For Churches and Private Dwellings, etc. JEWELLED MOSAICS.

Illustrated Catalogues Free.

**ALFRED GODWIN,**

1201 Market Street, Philadelphia, Pa.

## WOOD WORKING MACHINERY.

Band Saws, Jointers, Pony Planers, Shapers.

SPECIAL FOR CARPENTERS AND BUILDERS.

**E. & F. GLEASON, 250 Susquehanna Avenue, - - Philadelphia, Pa.**

## WINDOW GLASS. Malaga Glass & Mfg. Co.

—MANUFACTURERS OF—

High Grade American Window Glass

AND IMPORTERS.

FACTORIES,

MALAGA AND MILLVILLE, N. J.

OFFICE,

400 CHESTNUT ST., PHILADELPHIA.



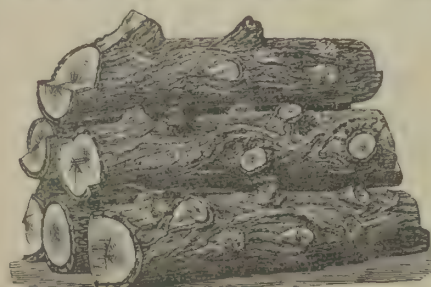
"GIANT" PORTLAND CEMENT,  
"EGYPT" PORTLAND CEMENT,  
"IMPROVED UNION" CEMENT,  
"UNION" CEMENT.

**LESLEY & TRINKLE, Sales Agents, 216 South Third St. Phila.**

## GAS FIRES

Resembling Wood or Coal.

Burning Natural or Manufactured Gas.



**HENRY P. DIXON & CO.,**

Manufacturers,

1330 Chestnut St., - Phila., Pa.

## SHAW & GEARY,

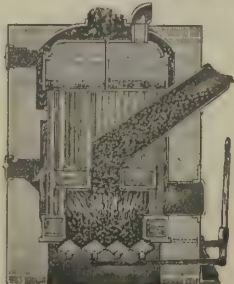
MANUFACTURERS & DEALERS

## ELECTRICAL APPLIANCES.

53 No. Seventh St.,

PHILADELPHIA.

### The BRONSON Improved MAGAZINE Base-Burning STEAM HEATING BOILER.



For Steam and Hot Water Heating. Auto-  
matic and Reliable. With Brick or Iron  
Settings, as you may prefer. The Bronson  
is constructed on scientific principles, the  
fire surface being of the best boiler tubing  
that can be obtained. This boiler exposes  
more water to the direct action of the fire,  
either in steam or hot water heating, than  
any boiler made. We are making a  
specialty of a High Grade All-steel Boiler,  
which we are anxious to place by the side  
of anything in the world for actual results.  
Reliable Agents Wanted. Send for illus-  
trated Catalogue and Price List.

**WESTON ENGINE CO.,**

Sole Manufacturers, PAINTED POST, N. Y.

CLAPP & BARRON, Sales Agents, 40 Cortlandt Street, New York.



## GEM SPRING HINGES

SINGLE AND DOUBLE ACTING. FOR SCREEN, MEDIUM AND HEAVY DOORS.



The 3 and 4 inch are the best in the market for  
Screen Doors.

FOR DOORS.		Length of Flanges.		JAPANNED.	
				Single Acting.	Double Acting.
Feet.	Inch.	Nos.	Per Pair.	Nos.	Per Pair.
6 x 2	3/4 to 1 1/4	63	\$0.70	83	\$1.40
7 x 2	1 to 1 1/4	64	0.90	84	1.75
7 x 2 1/2	1 to 1 1/4	65	1.10	85	2.20
7 x 2 1/2	1 to 1 1/4	66	1.40	86	2.80
8 x 2 1/2	1 1/4 to 1 3/4	67	1.75	87	3.50
8 x 3	1 1/4 to 2 1/4	68	2.50	88	5.00
9 x 3	1 1/4 to 2 1/4	69	3.50	89	7.00

Send for full Catalogue of Bronzed, Brass,  
and Bronze Metal Spring Hinges.

MANUFACTURED BY

**VAN WAGONER & WILLIAMS CO.**

82 Beekman Street, New York.























